COMMODORE 64 PROGRAMMER OF 1985–IS IT YOU?

your 64

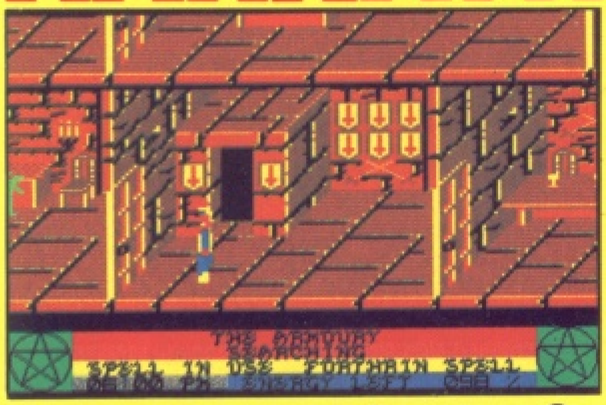
APRIL 1985

95p No. 8



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STAFF OF KARNATH



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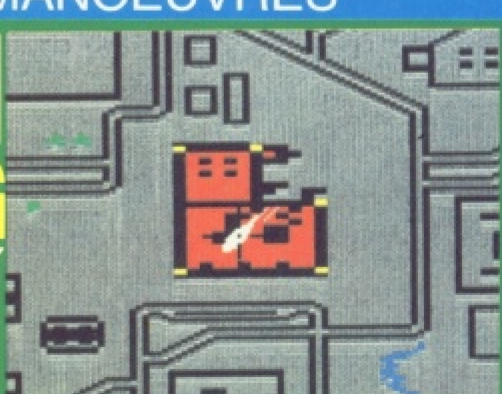
Y64 CHALLENGE

WHO DARES WINS!

Good At Games? Prove It!

TACTICAL MANOEUVRES

RAID ON BUNGLING BAY



A Guide For Games Players

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A man's home is his castle, but to you, Gandalf the Sorcerer, your castle is sacred. Or so you thought until the scalytailed lizardmen took a fancy to your treasure which is protected by an ancient spell.

Your castle is under seige. From the distant forest come waves of attacking slimy creatures, all bent on abducting your apprentices and holding them for ransom. If the lizardmen get all three apprentices, you must yeild to their greedy demands and release the spell on your treasure. You cast your power bolts, annihilating the attackers with a blast of fire, but still more come. Your magic power drains and you climb the tower to draw more from the shining star. But beware the deadly spider. If the lizardmen finally break down the castle door, you must battle them throughout the castle. And if they do kidnap your assistants, you must chase them through the woods before the creatures drag them, kicking and screaming, to Lizard Lair.

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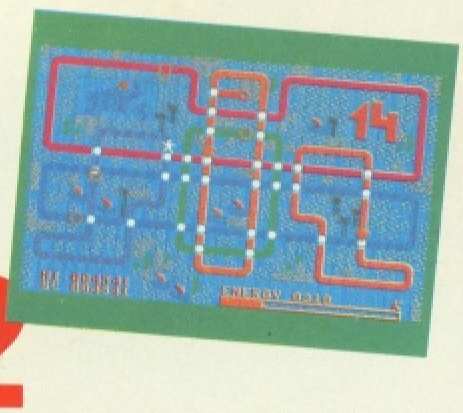




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(**Y64** Helpline enquiries between 10am-1pm and 2-5pm, Tuesdays and Thursdays **only**!)
Your 64, Sportscene Specialist Press, 14 Rathbone Place, London W1P 1DE.

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OPEN ACCESS

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New wave software from Bubble Bus?

In The Swim?

For those with watery tastes, Bubble Bus Software has released *Aqua Race* — a game written in machine code for the CBM 64. Complete with authentic 3D graphics (it says here) your task is to steer the racer around the course on-screen, watching out all the while for the jagged rocks that threten to send your vessel down to Davy Jones Locker!

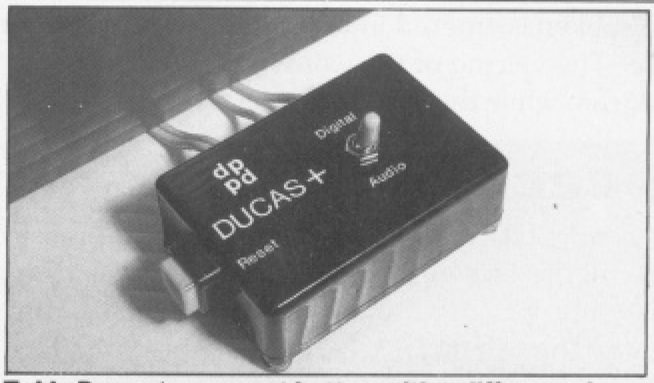
There's 20 different courses to race around, and Bubble Bus is claiming that the music accompannying the game has been especially written for it. (*Wow! Ed.*) You can catch Bubble Bus on (0732) 355962.

Buy This!

Ten software houses are joining forces to produce the computer games equivalent to *Band Aid*'s top selling single *Feed the World*.

Soft-Aid features ten of the best selling games from companies like Quicksilva, Activision, Ocean and Silversoft; titles so far include *Fred, Chinese Juggler, Pyramid* and *Worse Things Happen At Sea*.

Soft-Aid will be available in March. The tape will cost a mere £2.99 and all proceeds will go towards the Ethiopian Famine Appeal. If you want to hurry the proceeds along, don't bother Rod on (0703) 37497, just rush out and buy the tape!



Tek's Ducas+ — a reset button with a difference!

Versatile Reset

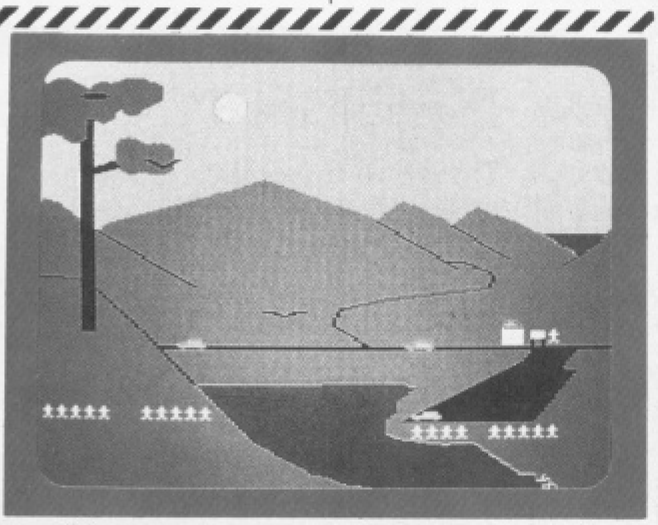
The Ducas+ is a new multi-purpose reset switch for the 64, on sale from Tek Services.

As well as being fitted with a 'cold start' reset button — to hoist the computer out of crashes — the Ducas+ is also kitted out with an audio/ digital selector. Switch the selector to 'audio', and soundtracks or musical effects can be recorded directly as games are being played; flip to the 'digital' position and security back-ups are as easy as pie.

The Ducas+ is supplied as standard with both five- and six-pin DIN plugs, for compatibility with the two sockets on the 64. A third cable, also with five-pin DIN, is wired to suit most makes of cassette player.

For a mere £15.95, you can purchase the Ducas+ along with its 'renew' cassette and instruction booklet, from Tek Services, 16a Appolo Street, Erith, Kent DAS 2AL. Telephone enquiries can be made on (0322) 347232.

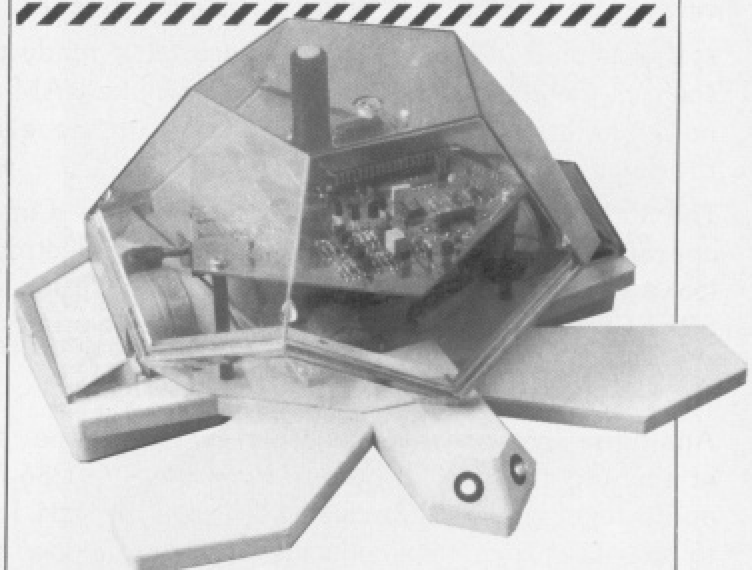
Go on, Crack It!



Osprey, a game developed in conjunction with the RSPB and designed to illustrate the complexities of wildlife conservation, has just been nominated for the Computer Trades Association Educational Program of the Year award.

With teams of wardens at your disposal, the aim of the game is to ensure the survival of the Osprey by avoiding such real-life hazards as egg theives, tourists and adverse weather conditions.

Produced by Bourne Education Software, *Osprey* is now available for the 64 and will set you back £9.95 for the cassette version and £11.95 on disk. Bird-lovers should get on the line with hopeful award winners Bourne on (0794) 523301.



Logical with LOGO, it's Valient's Turtle.

Souped-up Turtle!

Valient Designs Ltd has produced a new remote controlled turtle, for use in education, that can be interfaced with the CBM 64. Valient is also promising interface software to enable its turtle to be at the beck and call of the more popular versions of LOGO, as well as other turtle graphics programs.

The Valient Turtle has two independent stepper motors and is designed to move in units of one centimetre; it's also got the facility to draw smooth circles and arcs.

Sold as a package, complete with Turtle, instruction mannual, batteries, communicator, pen, power adaptor and software, the Valient Turtle will set you back £175. For further information, contact Valient Designs on (0532) 710431.



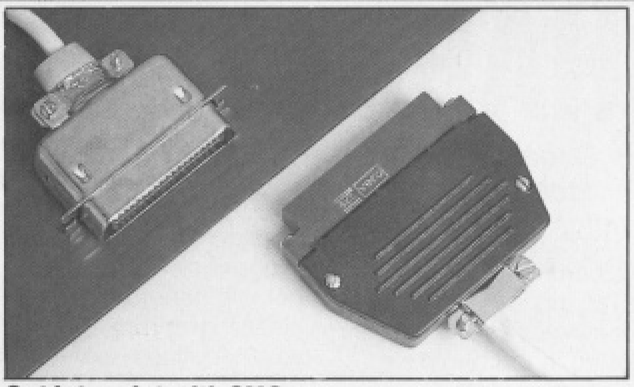
Anyone want an MSX? Eddie Kidd can't give 'em away quick enough!

You're Kidding!

Can you jump 25 cars on your CBM 64? Well, Craig Billington can on his ZX Spectrum, and Jason Ellis cleared 35 cars on his BBC 'B'!

The *Eddie Kidd Jump Challenge* competitions have been so successful that Martech has decided to run a third compo . . . and that closes on 31st May, 1985. Each of the three winners may choose between an Elswick Falcon BMX bike, a Toshiba MSX micro or a Philips TV.

C'mon all you 64 owners out there — let's see if you can outdo the Speccy/BBC users. Give Martech a ring on (0323) 768456 and get those entries in fast.



Get into print with SMC.

The Print Connection?

SMC Supplies has announced the availability of the Commodore Connexion — a joint printer cable and software product enabling the 64 to link up to any Centronics printer.

The Commodore Connexion offers two modes of operation, the first providing carriage control facilities for program listings and wordprocessing, while the second allows characters to be printed direct.

This tape-based program, located behind the kernal ROM, doesn't interfere with user memory and can be transferred to disk if required.

The Commodore Connexion is available from any decent computer store for £19.95. Further details wili be forthcoming from SMC on 01-441 1282.



Screenplay show off its new wares (of the soft kind!).

Win Compo — Lose Shirt!

Fancy a trip to Las Vegas — 'course you do. C'mon, admit it, you wouldn't say no to a freebie flight to 'gamblin' city', would you? Well, here's your opportunity!

Screenplay, the games software publisher, is offering a free trip as part of its special promotion on a whole list of games: *Asylum, Dunzhin, Pro Black Jack, Trivia, Arcade* and *Pogo Joe*.

So, how do you enter? Well, the fact is you don't even have to buy a game — although Screenplay would probably much prefer it if you did. As it is, just ask your local computer dealer for a draw ticket . . . but the *Y64* advice is don't hold your breath while you're waiting for your flight ticket!

ARCADE ACE

Send your tricks and tactics to Arcade Ace, Your 64, 14 Rathbone Place, London W1P 1DE.

OK people, so you think you can master arcade games do you? Well, it doesn't really matter 'cause I'm going to show you how it's done anyway!

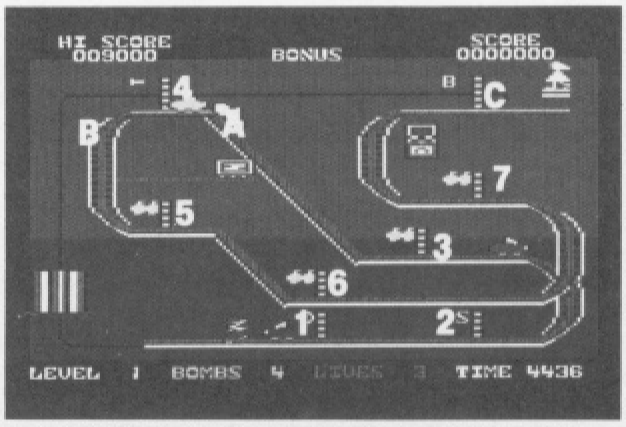
I'll be tackling two games this time — Ocean's *Kong Strikes Back*, and *Black Thunder. My tips for the first three levels of Kong Strikes Back* are explained visually (hence the screenshots!) but for some useful tactics on *Black Thunder* ... read on!

First off, I'd say that in my humble opinion, keyboard control is infinitely preferable to joystick. It's also worth noting that if anything's in line with you — even on a road further on — you can still blast them once they get close.

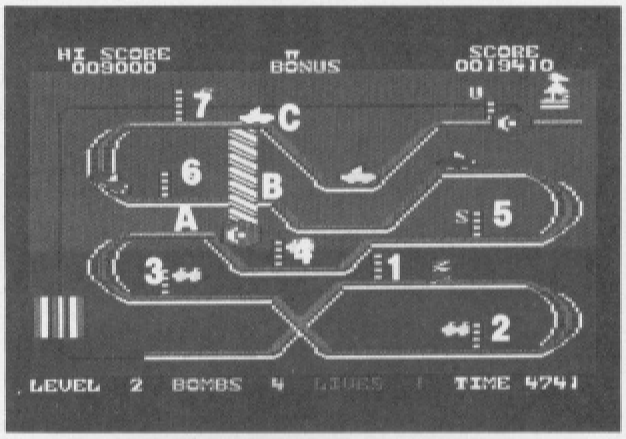
The enemy missiles, on the other hand, need a little bit more attention. You have to let them get close, take a side road and decelerate ... and then accelerate for all your worth. This'll need a little practise, but you should find the missile will have pulled in front of you ... and that's your cue to zap it!

Helicopters are sneaky critters — but the way to avoid them is to use the 'decelerate/accelerate' routine — but this time, fire your missile straight up! Another potential danger is from the UFOs but if you use the ol' 'decelerate/accelerate' routine again, it'll end up in front and you can shoot it out of the sky!

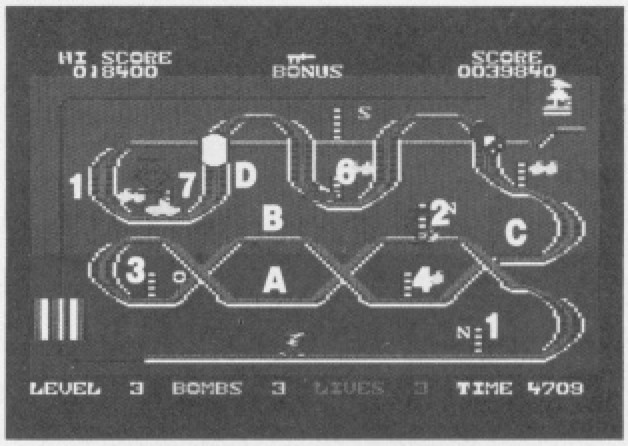
Well that's it for this month, I'm off to snap a few joysticks. But remember, if you've got any problems getting through any level of any game for the 64, or you'd like to share your tricks and tactics with rest of the *Y64* populace, write to Arcade Ace, *Your 64*, 14 Rathbone Place, London W1P 1DE.



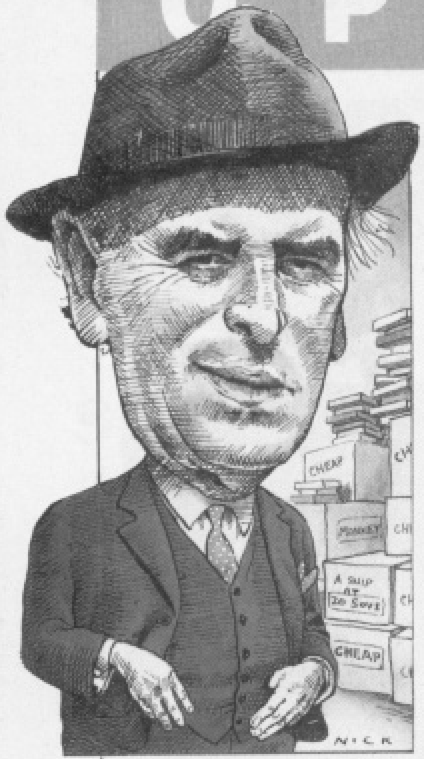
To start off, go right and collect the cherries at *1, wait under *2 until the cars go overhead, and then climb the ladder. Once the cars have passed by, go to *3 and head for *4. Wait at A until the cars go overhead, then climb ladder *4 and sit tight. Continue round to *5, pausing at B, and work your way round to *7. Collect the cherries at *7, then go to the bottom of the ladder at C. You can now bomb the cars coming round the top which will earn you 500 points a piece. Now go back up ladder *7 and wait for the cars to pass by and you're home and dry!



As soon as the action starts, ease your joystick to the top right if you want to avoid a headache! Now work your way round to *2 and climb the ladder. When it's clear, go to A and wait. Make tracks for *5, wait for the cars and then go to *6 and wait at B. Once the cars coming up the left-hand side have passed, collect the cherries at ladder *7. When the cars get to C, start to bomb to the right, and then head for your loved one!



Although fairly simple to complete, you'll not be using your bombs to gain extra points — you'll need them to survive! First off, climb ladder *1 and wait. Then, head for *3, waiting briefly at *2 and A (for obvious reasons!). Now got to B and bomb the cars at C. Run for *5 as fast as you can (you may need to stop at *4), climb ladder *5 and wait ... then run for *6 and climb the ladder. Now, rush off to D and, as soon as the spring goes down, zip up ladder *7 and return to D. You can then head for home. Good luck on the fourth level ... you're on your own now!



Nice Little Earner?

Dk'Troniks, in conjunction with Thames TV, has just released *Minder* — based, as you've probably already guessed, on the TV series starring Terry and Arfur! We're promised the game will be as disreputable as the characters involved, and that it'll feature such infamous locations as the 'lock-up'. Terry's flat and Dave's Winchester Club.

You take the part of Arthur 'con-man' Daley, and the criminal object of the game is to wheel and deal with the usual crowd of shady characters. You're whisked around in the trusty 'Merc', and the *Minder* theme tune plays all the while — just in case you'd forgotten which game you're playing.

On your nefarious way, you're quite likely to bump into Terry, Dave the barman and poor old Ricott . . . who's lot is definitely not a happy one. The game is fully interactive and is likely to answer every question you put to it — truthfully . . . or not!

For 'the word', contact Dk's grass Roger Barnard on (0799) 26350.



MP Robert Dunn finds the Hi-Tech exhibition an education!

Educational Exhibitionists

The Hi-Technology and Computers in Education exhibition, held at the Barbican Centre, London, earlier this year, proved to be a great success. The exhibition was designed to bring education and industry together, and was opened by Robert Dunn MP, Undersecretary of State for the Department of Education and Science.

Over 290 exhibitors managed to make it on the day — but perhaps the biggest surprise was the public turnout, even to the point where the seminar groups held were turning away prospective listeners! Commodore International was there, of course, proudly demonstrating its educational software on the 64, as well as the C16 and Plus 4 computers. One particular program worth a second look is Commodore's LOGO, priced at £34.95.

Despite the 'Under-18s not admitted' ban — which is a bit of a shock when you consider that they're the very people who'll be taught by computer — the Hi-Technology and Computers in Education exhibition will probably be around next year.

Finger Trouble

Sorry folks! Apologies to all those who've spent hours trying to get through to AS Denby (Open Access, *Y64*, issue 6) about the reset button. We unfortunately omitted to mention that the phone number (0789 763502) would only be answered between 4 pm and 10 pm.

Rocky Horror Returns!

CRL is about to release *The Rocky Horror Show* as a fully animated graphic adventure, claimed to be programmed in 'wonderful rockyramascope' — whatever that is?

CRL tells us that the game is full of laughs, Transylvanian parties, romance, thrills and chills — but it's keeping the plot of the game well under its cape for the meantime. All the company will guarantee is that it's going to be the only non-sexist program available as you can take the place of either Janet or Brad, the two lead characters. Wow!

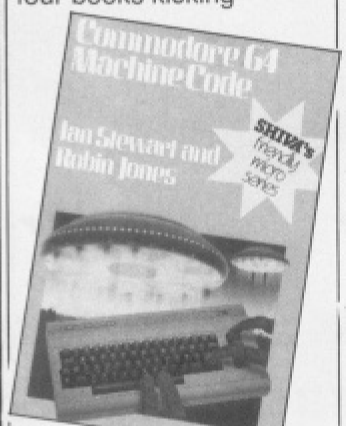
Hassle CRL on 01-533 2918.

HARD LINES

Choosing a machine code tutor for your bookshelves isn't the easist of tasks ... unless you heed the advice of Chris Palmer.

Behold! a person evolving into the computer age. Struggling along in the turgid quagmire of Basic until one day (cue *Thus Spake Zarathusa*) a huge monolith in the shape of machine code appears. But how is the beginner to comprehend this evolutionary step? Simple, head off to your nearest bookshop!

Which neatly (*Oh yeah! Ed.*) brings us to four books kicking



around the *Y64* office, all of which profess to lead us to a more fulfilling life through machine code.

Looking first to *Machine Language For The Absolute Beginner* by Danny Davis, you might be interested to know that our Antipodean cousins from Melbourne House mean exactly what they say — it's for the absolute beginner! The book starts with some very simple explanations of the underlying concepts of machine code and, by chapter eight, you're already learning how to put up a Hi-res screen! A well-presented book that actually lives up to its title.

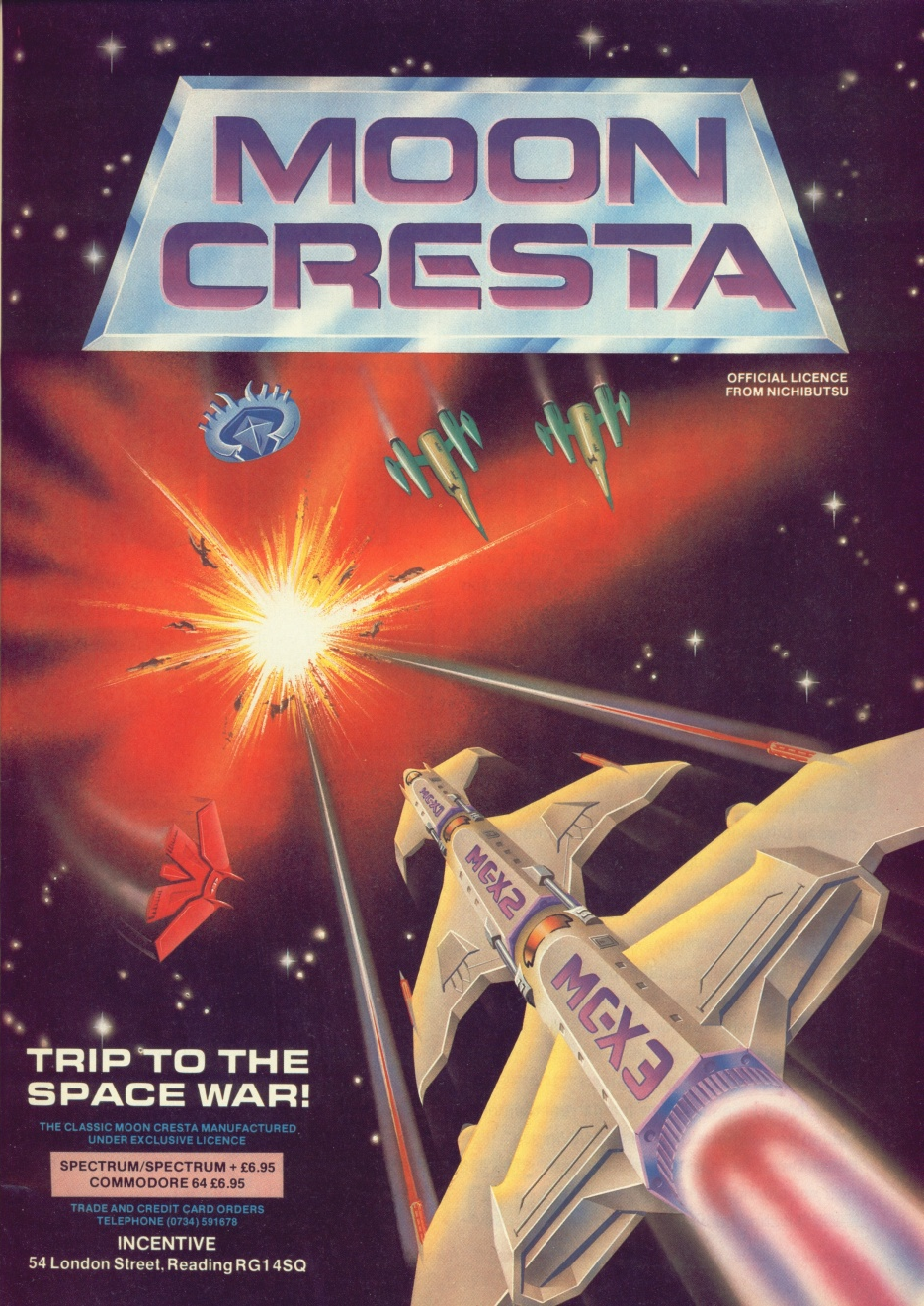
The second entry from down-under sails under athe title of *Supercharge Your Commodore 64* and it's penned by Barry Thomas. Unfortunately, this one doesn't live up to its title. It professes to supply you with a set of ready-made machine code utilities to help you write 'more spectacular' programs. All you in fact get is a handful of simple sound, graphics and sprite routines, along with a couple of utilities. Not very inspiring!

Out third contender hails from Shiva's 'friendly micro' series. Written by Ian Stewart and Robin Jones, *Commodore 64 Machine Code* provides a straight forward explanation of machine code principles, based on the 64, but there's nothing too exciting. Luckily, it's saved from being an also-ran by the inclusion of some wonderful *Cosgrove* cartoons; it's almost worth buying the book just to catch up on the adventures of this hapless group of bugs!



Finally, we end up with a weighter tome in the form of CI Burkinshaw's *Beyond Basic On Your Commodore 64* from Sigma Press. This one doesn't hang around — it's straight in there with hexadecimal and a diagram of the 6502 chip before you've even got your coat off! Out of all the books, this is the one that believes that if you throw enough facts at someone, they'll lodge in their brain eventually! Oddly enough, despite its somewhat 'public school' approach, this was the only one to give you a game to type in at the end.

Machine Language For The Absolute Beginner, ISBN 0 86161 1454, £6.95; Supercharge Your Commodore 64, ISBN 0 8616 1748, £6.95; Commodore 64 Machine Code, ISBN 0 906812 968, £6.95; Beyond Basic On Your Commodore 64, ISBN 0 905104 91 9, £6.95.



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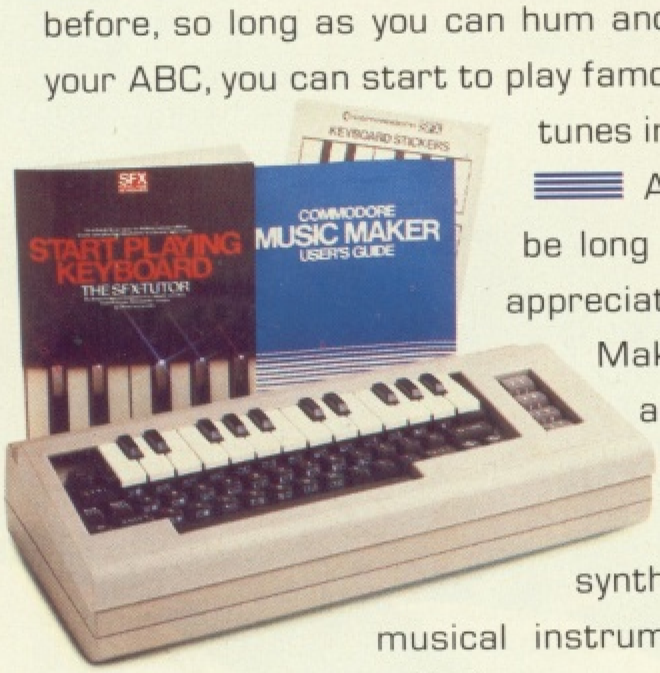
New packages will be introduced to the Gold Medallion range every so often, but only if they are really exceptional. They'll definitely be hard soft to beat.

Miss any of them, and you really will be missing out.

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Whether you're an accomplished musician or an out-and-out beginner, Music Maker strikes exactly the right note.

No matter if you've never played a note before, so long as you can hum and you know your ABC, you can start to play famous popular tunes immediately.



And it won't be long before you appreciate Music Maker's many advanced capabilities: you can synthesise many musical instruments, even create your own 'synth' electronic sounds, choose between monophonic or polyphonic play, summon up pre-programmed rhythms and bass accompaniments, and more.

Music Maker is the first in a series of packages which will fully exploit the Commodore 64's outstanding musical capabilities.

On disk or cassette, with music keyboard, a clear and concise manual, and song book, for just £29.95.

SPIRIT OF THE STONES

It's a treasure hunt for 41 real diamonds hidden somewhere on the Isle of Wight.

Only one man knows where they are, and he's not saying.

All that he has to say he's said already – but in the form of riddles, clues and puzzles.

Solve the puzzles in the Spirit of the Stones program and you'll find it much easier to solve the puzzles in the Spirit of the Stones book.



Solve the puzzles in the book and one (or more) of the diamonds can be yours.



Whoever discovers a diamond can also claim his or her share of the Royalty Fund, which could grow to a maximum of £1 million. It's a game that's as entertaining as it can be rewarding.

On cassette or disk, £14.99.

INTERNATIONAL FOOTBALL

Already it's recognised as the best football game ever seen outside of Wembley.

It's startlingly life-like, and gives you near perfect control of the players.

You can kick the ball, dribble it, pass it,

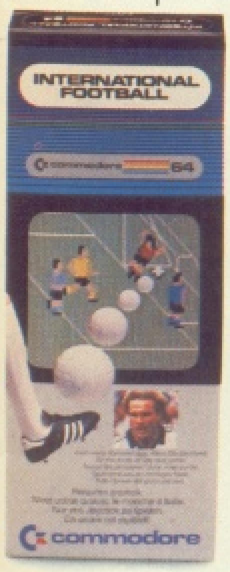
FOR MORE INFORMATION CONTACT: COMMODORE INFORMATION CENTRE, 1 HUNTERS ROAD, WELDON, CORBY, NORTHAMPTON NN7 1QX. TEL: CORBY (0536) 206252

D MEDALLION. HAVEN'T GOT IT AVEN'T GOT IT.

head it or even throw it in from the touch-line. And every time you belt the ball into the net, the crowd cheer wildly.



How often you score depends on how good you are, and also at what level you choose to play.



There are 9 levels you can play against the computer. Or you can play a friend.

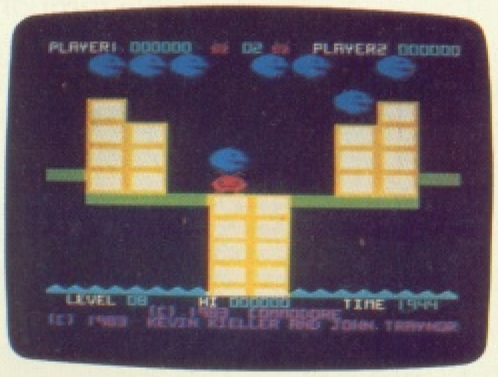
International Football is a real test of skill, dexterity and speed. It is certain to drive you football crazy.

On cartridge, £14.99.

JACK ATTACK

There's no other game like it. It has been voted by the U.S. magazine 'Electronic Games Hotline' as a 'must buy.'

Jack Attack is about squashing heads. It's an addictive game, a game of strategy and cunning. We can almost guarantee it will turn you into a head-case.



To stay alive, Jack must leap aside from collapsing bridges and crashing blocks, and at the same time he must make sure he doesn't fall into the water... and drown.



And that's the easy bit.

Because everywhere Jack goes he's dogged by jolly bouncing sadistic heads that are out to nut him.

He has to squash their heads before his is squashed.

And Jack can't afford to lose his head because we've only given him three, and when they've gone, he's gone...

Jack Attack is available for both the Commodore 16 and Plus/4. On cartridge £14.99.

commodore
HARD SOFT TO BEAT

SELECTED TITLES AVAILABLE FROM BOOTS, WH SMITH, WOOLWORTH, SPECTRUM, JOHN MENZIES, OTHER LEADING RETAILERS AND SPECIALIST COMPUTER STORES.

COMPUNET CORNER

For the uninitiated, Surya explains how you can make the most of the Your 64 pages on Compunet.

Compunet is a dial-up computer service that at present is available exclusively to 64 users — and you can bet that *Y64* is on it! Full details of everything it offers can be found in the review that appeared in our last issue.

Meanwhile, here's a brief look at how you can gain access to the system and what you're likely to find from *Y64* when you get there...

First, the hardware shopping list. You'll need a telephone line that terminates in a rectangular British Telecom socket. If your phone doesn't boast a socket, or else it has the old-style round one, BT will change it and charge the shameful fee of £18. Once that's sorted out, you'll need a Commodore Communications Modem — which is available from Commodore (0536-205252) for £99.95 and includes your first year's subscription to Compunet.

Around about the time your modem arrives, you should also be receiving your Compunet user ID and password. Keep these to yourself; illegal users of your modem will be inflicting severe GBH on your Compunet bill.

The modem plugs into the cartridge socket just like any other cartridge — but remember to switch off your machine before inserting or removing it. Plug in the modem, remove your phone lead from its socket and insert in its place the white modem lead.

When you switch on your 64 you should expect to see a white sign-on screen, plus a message informing you that you're toying with 'Compunet Ver 1.0'. If you get the normal blue sign-on screen, switch off and check that the modem is fully located — then switch on and try again.

Once you're fully plugged-in, follow the instructions given in the Compunet manual for dialling you local number and logging on. When you've done that, select 'GOTO' from the duckshoot (the scrolling menu at the bottom of the screen) and press RETURN. You'll then be prompted to enter the page number. Enter **GOTO 109227.**

That'll whisk you off to the *Y64* area.

You'll find two types of file shown in the *Y64* menus. The first are text files and these are free; they may contain news or public messages from us. Most, however, will be program datasheets and each will tell you about a *Y64* program that you can download into your machine. To read a datasheet, use the 'up/down' cursor key to highlight it and then select 'SHOW' from the duckshoot.

The main aim of the *Y64* area on Compunet is to save your poor worn-out fingers the trouble of typing in listings from the magazine. Therefore, the second type of file you'll find in our menus are program files. Once you've read about a particular listing either in the magazine or the datasheet — highlight the program and select 'BUY' from the duckshoot. Each listing costs a mere 50p ... sufficient to cover our costs on Compunet, and no more.

When you 'BUY' a program, it'll be downloaded automatically into your machine and, naturally, when it's finished you don't need me to tell you to SAVE it to tape or disk. To run the program again, you must have your Compunet modem plugged in before loading. The modem allows you to use you 64 normally and the only time you should have to remove it is when you're dealing with machine code programs.

You can also send messages to *Y64* via Compunet. Write your letter using the 'EDITOR' (save money — do it *before* you log on to Compunet) — then, once you're in the system, select 'MAIL'. Address all mail to 'YOUR64' (note that there is no space between 'YOUR' and '64').

You can send letters to the magazine this way, not to mention requests for technical help (which we'll reply to via Compunet as soon as possible).

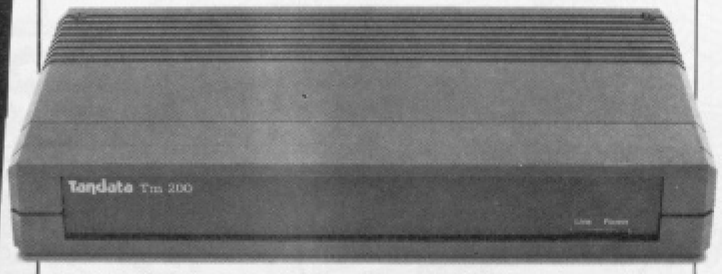
We'll be publishing the most interesting letters in the magazine. Finally, the 'over to you' bit. If you've any ideas for things we could or should be doing on Compunet ... just get in touch!

Modem Pricing GBH!

Good news for all modem hunters

The price of Tandata Marketing's TM200 multi-baud rate modem has been reduced from £217 to £173 (cheers!) but plus, 15 per cent VAT.

Tandata's other modem, the TM100, remains at its usual price of £99 + VAT, but communications freaks can find out more from Tandata Marketing on 01-940 6211.



The TM200 — complete with autodial/autorecall.

Cheapos In Space

In a moment of divine inspiration, Mastertronic has just released a new cheapo game for the 64, entitled *1985*.

The object of the game is to guide a spacecraft through a series of caverns in order to collect the nuclear plasma . *1985* is available on cassette and costs just £1.99. Call Mastertronic on 01-402 3316 for further details.

Who Struck Gold?

Thanks to all the readers who responded to our £2,000 US Gold competition (*Y64*, issue 4). To remind, you were asked to put in order of preference, the nine qualities of making a game 'great'; we asked too for you to write your own additional feature.

Actually, we had a great response from you all, and the overall winner of the 1541 disk drive and a complete supply of all the US Gold games produced to date (and for the rest of his life to boot!) turned out to be VN Cockayne of Stourbridge, W Midlands. He sent in the correct order of '1e, 2h, 3i, 4c, 5g, 6f, 7d, 8b, 9a' — then wrote as his extra feature, 'The facility to re-enter the game at pre-designated stages, thus avoiding repetitious preamble'. Well done, Mr Cockayne!

The ten runners-up were all close and each wins a complete range of US Gold games. They are: Irene Skolfield, Feltham, Middlesex; David Brian, South Harrow, Middlesex; S James, Highton Liversedge, West Yorks; Jennifer Halligan, Dagenham, Essex; Toby Hughes, Reigate, Surrey; Giancarlo Bernini, Wood Green, London; John Clarke, Haxby, York; David Blake, Hertford, Herts; N Doctor, Stroud, Glos; and David Man, Luton, Bedfordshire.

Finally, the 50 'near misses' who each receives a US Gold game are: K Nobbs, Co Durham; Mark Lennon, Leicestershire; steven Blackett, Co Durham; Michael Smith, St Ives; H Li, London; A Aston, Stoke-on-Trent; H Hvidberg, Denmark; P Billings, Essex; P Attwell, Berkshire; Michael Lloyd, Tyne & Wear; Philip Slater, Devon; Andrew Fowler, Surrey; Martin Ferris, Wiltshire; P Crisp, Walsall; John Worts, Hertfordshire; Gordon Hamlett, London; T Watson, Cheshire; Chris Raeburn, Dalkeith; W Chalmers, Aberdeen; I heather, East Sussex; T Vanderweele, Hertford; Phil Sherry, Essex; Richard Bust, Kent; Sam Man, Glasgow; Donald Macpherson, West Linton; Karl Stokes, Oswestry; A Hurds, Glasgow;; Martin Wilson, Sheffield; Gobin Michel, Belgium; Francis Yu, Bolton; Richard Gray, Dumbartonshire; Neil Hall, Co Durham; G Wall, Wolverhampton; John Martin, Crawley; Andrew Carson, Birmingham; Mark Carmichael, St Albans; Craig Jones, Dyfed; David Kelham, Bournemouth; Shaun Daire, Antrim; John Manby, Dundee; Clare Vint, Norfolk; Luke Hindmarsh, London; I Shaw, Kettering; Bruno Kaiser, Schweiz; Peter Felming, Guernsey; M Dennison, co Limerick; CE Harland, South Croydon; Flemming Larson, Denmark; John Tibaldi, Richmond; and Marcus Parry, Dorset.

Congratulations to all our winners.

Cheetah Chatter

Fancy a friend to have a chat with? Well, with the Speech Synthesis Module from Cheetah Marketing, you'll be able to program it to be just the sort of companion you've been looking for!

Operating on the allophone method of speech synthesis — that is, the construction of whole words from smaller portions of sound — the Speech Synthesis Module is to be retailed at a sum "well under £30" If you fancy hassling first-hand, give the company a bell on 01-833 4909.



REWRITE THE HIGH SCORE TABLES

So, you've got a Commodore. You've also got enemies. With the Gunshot, you'll have all the opposition cowering in corners. 8-directional action and an all-in-one moulded stem allows accurate annihilation and strength to survive those all-night sessions. Dual fire buttons for fading fingers (and a rapid fire version when they're really coming thick and fast). And, if you break it (and we know you'll try) our 12-month guarantee will prove invaluable. Only £8.95. The Gunshot plugs directly into the CBM 64 and Vic 20.

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MISSIVES

Witty, intelligent and imaginative readers write to Missives, Your 64, *14 Rathbone Place, London W1P 1DE. So, let's be hearing from you!*

Spectrum VS 64?

I am a Spectrum owner with access to a 64, and I was disgusted to read the various comments about Sir Clive's flagship in *Y64*, issue 7.

In your Open Access section, under the headline 'Turn your 64 into a 35K Spectrum?', I read that the Spectrum was spriteless, had no Hi-res graphics and apparently can only BEEP! Of course, the Spectrum can produce graphics to compare with the 64, it does have sprites and has been known to come up with the odd 'good tune' (although even I must admit, not a patch on the 64). Another point I'd like to make quite clear is that the Spectrum offers 39K of RAM, which is more than the 64 when it's making use of all its features!

As I'm warming to my theme, perhaps you'd like to turn a few pages of the same issue and look at a letter from James Strang in your Missives section. He was complaining about all the top machines and then proceeded to tell us that he wished people would stop complaining about machines other than their own. A bit hypocritical, don't you think? As for his remarks about the Spectrum! Adding a disk drive to the 64 costs more than the Spectrum alone. And as for flipping out the ROM to reveal full RAM — even I know that this will leave the 64 useless!

I hope that you'll publish this letter as I'm dying to see if Mr Strang will dare to respond . . .
F O'Farrell, Bray, Co Wicklow

I'll be interested to hear what Mr Strang has to say as well . . . and anyone else who wants to throw in their half-pennyworth. Far be it from me to criticise the ZX Spectrum — but I'm not sure it's quite how you describe it. Ed.

Nobody Does It Better?

All magazines have faults . . . and, in my humble opinion, I'm fed up with one of your advertisers.

In mid-October, I ordered and received a copy of *Caverns of Khaffa* by US Gold from Miles Better Software. Unfortunately, the game wouldn't load, so I returned it by first class post. Now, four months later, I'm still waiting for a reply!

I've phoned on four separate occasions and been told that it was in the post. But on my last phone call I managed to get someone to admit that it just might have been lost in the post.

I know you're not Esther Rantzen, but is there anything you can do to help. It looks like such a good game . . .
Michael Trotter, Eastbourne, Sussex

Do I look like Esther Rantzen? Anyway, we gave Miles Better Software a buzz to check up on your order and it seems that the trouble was that your cassette interface was having problems coping with the new 'fast loaders'. Is anyone else out there having trouble with the Turbo-charged loaders? Let's be hearing from you . . . Ed.

For Cobal, Read Comal!

I'm writing to try and help JL Masterman from Middlesborough who wrote in Missives (*Y64*, issue 6). He asks if there's a version of COBOL for the 64.

Well, to the best of my knowledge, the nearest version of any language to COBOL (and one that's available for the 64) is COMAL (Common Algorithmic Language). This has many of the same commands that you'll find in COBOL, but it also includes others that make use of the 64's excellent sound and graphics capabilities.

On a recent course to enable me to teach computer studies, I was given a series of sample programs in several languages, including COBOL. The funny thing was that I was able to type the COBOL program straight into the 64 — with COMAL loaded in — virtually as it stood! Another point worth noting is that COMAL is an excellent language to teach others how to program — it's much, much easier to demonstrate structured programming; it's also the language that's taught in schools in Denmark, Sweden, Ireland and Scotland.

Commodore will soon be launching a 64K cartridge containing COMAL for use on the 64 that'll give 60K of usable RAM! But if you can't wait until then — write to the ICPUG 'COMAL man' Brain Grainger, 73 Minehead Way, Stevenage, Herts, and he'll transfer the language to a blank disk for you. Of course, you'll have to supply a blank disk and the return postage.
Geoff Crowther, Leicester

Cheers Geoff, that's a real nice offer for any readers wanting to get hands-on experience of COMAL before Commodore release its cartridge. But do remember to send a blank disk and the return postage! Ed.

Down in the Dumps

As a regular reader of *Your 64*, I am writing to you for advice. My problem is that I'm unable to dump screen graphics of commercial games to my MPS 801 printer. I've had a few attempts at the code myself and I'm beginning to get the impression it cannot be done.

I ended up getting hold of the *Tony Hart Art Master* program, but I'm sorry to say that I can't even get a printer dump from the demo programs! And if that wasn't painful enough to admit, the same thing applies to Talent's *Panorama H*.

This may sound like a silly question . . . but there isn't anyone out there who happens to know of a commercial program to accomplish this small feat? Of course, if anyone's clever enough to have written a routine themselves . . .
Arthur Soutar, Lanarkshire

There must be someone out there who can come to Arthur's aid . . . Send your routine to Missives, *Your 64*, 14 Rathbone Place, London W1P 1DE — and there's a special software surprise for the first one received that works. You'll also get your program published in our fair magazine — so start tapping away tout suite! Ed.

Stone Me!

I was interested to read your article about Gordon Ashbee and the Robot Workshop (*Y64*, issue 5).

At the moment, I'm working for the Playbus Computer Project, a group that takes computers to local youth clubs, libraries, playschemes and so on. Anyway, to cut a long story short, we're using LOGO and obviously, we're in the market for a turtle. We also have a group who are interested in programming a robot — it's even been suggested that they build one from scratch!

So, after reading said article, I set out to find the Robot Workshop, following the sketchy details in your article. But after a two-hour search of the area that could possibly be described as within "a stone's throw of Earl's Court" (which isn't South London, by the way!) I had to admit defeat. I couldn't find the place and nobody I spoke to had heard of it.

OK Ed Rowetitt (if that really is your name!) — where was I going wrong? Perhaps there really is an Earl's Court in South London . . .
Ian Miller, Hammersmith & Fulham Playbus Association

Well, Ian, you must have been really close to the Robot Workshop. It's actually at 121 Ifield Road, London SW10 (Tel: 01-373 8571). (Here at Y64, we regard anywhere South of Rathbone Place as being somewhere in South London!) Next time you go looking for somewhere in Earl's Court, I'd suggest you stop throwing stones and give us a bell on the Y64 Helpline (Tel. 01-636 3513). Ed.

Printer Problems

I wonder if you could help me with a query concerning the use of Commodore printers and printer/plotters.

At the moment, I'm using a VIC 1525 graphic printer for things like listings and so on — but I'm looking to getting hold of a printer/plotter eventually. Now, I know that the plotter is device 6 and my printer is switchable between device 4 or 5 printer and plotter. Does it mean I have to unplug the 64 each time I want to use a different device?

Is there a 'splitter' available that would enable me to connect both devices to the 64 at once? I can't be the only person with this problem . . . can I?
PW Nicholson, Plymouth

It certainly *is* possible to have both the printer and plotter connected to the 64 at once. All you have to do is plug either of the devices into the back of the 64, and then plug the other into the one already connected. Both printer and plotter have input and output sockets. Ed.

MISSIVES

Just Like That!

Here are some hints and tips for a few of my favourite games.

Aztec challenge: Level 2: Stick to the edges of the stairway and nip in and out of gaps when necessary. Level 3: Stop just inside the door of each room but make sure you enter a small amount or you die: you soon realise how far you need to move. Then decide upon your tactics according to the nature of the room. Level 4: The vermin: If there is more than one animal in your path and they are very close together then keep jumping and you should get through. Level 6: The piranhas: wait just off the screen for a gap and when one appears, charge! Dive a lot!

Motor Mania: On the cross roads it is possible to pull off the screen, to the right and disappear. The only trouble with this method is getting back to refuel but to solve this POKE 8646,255 before you type 'SYS8000'. This will give you infinite lives.

Skramble (Anirog): 3rd sector: fireballs: go to the extreme left of the screen. This gives you a much longer time to dodge the fireballs. 5th sector: maze: pull your spacecraft as far to the right as possible and when you pull back to go up you have some leverage to allow you to do this. Once you have pulled back, push it forward again.

Falcon Patrol: Go to the top of the screen and let the aircraft past. Then go after them and shoot them down.

Aztec Tomb: Many people do not seem to be able to cross the stream so here's how. The capital letters are the words to use, OPEN the DOOR using the key in the drawer, in the bedroom, and outside CLIMB BUILDING. On the roof there is a piece of wood. GET WOOD and climb down. Go to the stream and DROP WOOD. The wood will form a bridge. CROSS the BRIDGE and you're over.

Does anyone know how to get the jar to water the plant? If so could they write to me via this magazine.

Revenge of the Mutant Camels: There is a cheat mode on this! Type GOATS and the message 'cheat mode operative' should appear. To leave a stage hit the space bar.

Here are some tips for those of you who don't like cheating.

Silly Silicon: Stand roughly in the middle and most of them will miss you. If one should approach then duck.

Sidney and the Portalavs: Forget Sidney! Just hit the portalavs and you can get 70,000+. This kiosk is a nuclear free zone: There are two approaches to this: (1) My method — go to the far right of the screen and keep firing off screen — this will keep the telephones off and you will find that the CND signs tend not to fall on you. (2) Jeff Minter's method — build up the phone boxes on the screen and you will find less CND signs fall (eight sprites on the screen!).

International soccer: Shooting: Either go right up to the goalie and if he dives hold it and put it in the net after he's dived (on the lower levels go past him and score). Run diagonally across the goal area and then turn and shoot. If you are on target you nearly always score as the goalie does a straight jump.

Goal kicks: Go to the edge of the screen and, as the ball is kicked, start to run. You should, if you timed it well, be running with the ball somewhere above you giving you a good chance of getting it.

The Hobbit: To escape from the Goblin's dungeon, command Thorin or Gandalf to 'carry me' then command to 'open window' and finally to 'go through window'. You will probably find these work best as three separate commands.

To escape from the wine cellar in the Elevenking's palace, kill the butler with the sword, empty the barrel or drink its contents (not advisable as you become drunk!), tie a rope to it, carry it (if you have Thorin tell him to get in it) and, throw it through the trapdoor and jump.

Toby Hughes,
Reigate, Surrey, RH2 7QT

Well, that lot's got to be worth a bunch of software — watch out for the Postman, Toby! If anyone else has fought their way through to the far reaches of a game, write to us and tell us all about it. And, if you're into tricks 'n' tactics, check out Screenplay in Open Access this issue. Ed.

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YOUR TOP TWENTY

THIS MONTH	LAST MONTH	TITLE	COMMENT
1	10	**GHOSTBUSTERS** ACTIVISION	INSTEAD OF GOALS, WE'VE GOT GHOULS IN THE TOP SPOT! "GAME OF THE YEAR" — GIANCARLO BERNINI
2	1	**INTERNATIONAL FOOTBALL** COMMODORE	KICKED OUT FROM THE TOP OF THE SOFTWARE LEAGUE — THE SEASON'S NEARLY OVER!
3	3	**DALEY THOMPSON'S DECATHLON** OCEAN	BRONZE AGAIN! CAN DALEY KEEP HIS POSITION NOW THAT SUMMER GAMES ARE APPROACHING?
4	7	**JET SET WILLY** SOFTWARE PROJECTS	WILLY LOOKS SET TO JET INTO THE TOP THREE . . . WITH YOUR HELP, OF COURSE!
5	2	**BEACH HEAD** ACCESS	IT LOOKS LIKE THIS WAR'S GOING TO BE A WASHOUT — BEACH HEAD'S SURRENDERED ALREADY!
6	NEW	**SUMMER GAMES** QUICKSILVA/EPYX	SUMMER GAMES SETS A Y64 OLYMPIC RECORD FOR THE HIGHEST NEW ENTRY!
7	NEW	**IMPOSSIBLE MISSION** CBS/EPYX	THEY SAY THIS ONE'S IMPOSSIBLE . . . HAVE YOU CRACKED IT YET?
8	8	**THE HOBBIT** MELBOURNE HOUSE	C'MON YOU LOT — WHO'S GOT THE HOBBIT HABIT? SEND YOUR VOTES NOW!
9	9	**HUNCHBACK** OCEAN	WE HAD A HUNCH THIS ONE WOULD STILL BE HANGING AROUND IN THE CHARTS.
10	13	**FOOTBALL MANAGER** ADDICTIVE GAMES	"THIS GAME ALWAYS MANAGES TO BOUNCE BACK EVERY NOW AND THEN" — NEIL LAMBE
11	NEW	**RAID OVER MOSCOW** US GOLD	AN OBVIOUS TITLE FOR A COMMIE 64 GAME . . . AND A FAVOURITE AT THE WHITE HOUSE.
12	6	**TALES OF THE ARABIAN NIGHTS** INTERCEPTOR	A BIG DROP FOR THE ARABIAN NIGHTS — WHAT HAPPENED, DON'T YOU LIKE THEM ANYMORE?
13	RE-ENTRY	**ZAXXON** US GOLD	A GAME THAT'LL PLAY HAVOC WITH YOUR NERVES! GOOD TO SEE IT BACK.
14	NEW	**THE STAFF OF KARNATH** ULTIMATE	A NEW ENTRY THIS MONTH — CHECK OUT THE Y64 MEGA-REVIEW THIS ISSUE!
15	RE-ENTRY	**VALHALLA** LEGEND	THE VIKINGS ARE BACK WITH A VENGEANCE! WE WARNED YOU THIS COULD BE A LEGEND!
16	5	**REVENGE OF THE MUTANT CAMELS** LLAMASOFT	AN AWESOME GAME FROM MINTER. YOU'D BETTER VOTE FOR IT — CAMELS ALWAYS GET THEIR REVENGE!
17	14	**FORBIDDEN FOREST** AUDIOGENIC	"LEAVES THE REST IN THE SHADE" — MARCUS HAUSEN. SO WHAT'S IT DOING AT NO. 17, MARCUS?
18	NEW	**ALIEN** MIND GAMES	ALIEN'S POPPED INTO THE CHART FROM NOWHERE . . . AAARGH, MY STOMACH!!
19	NEW	**MATCH POINT** PSION	PSION SCORES AN ACE OUT OF SEASON WITH THIS WIMBLEDON SIMULATION.
20	NEW	**TAPPPER** US GOLD	A GAME THAT'LL SOON BUILD UP YOUR THIRST! CHEERS!

WHO DARES WINS!

How do you rate yourself as a games player? If you reckon you're pretty good, tell us your high scores — and we'll see if we can make you into Y64 games consultant! Read on ...

Here at *Y64*, we'd like to thank you for all the support you've given us in the compilation of our unbiased Choice 20 chart. But don't think for a second that we're going to stop it — rather, the idea's going to be taken further! Take a look at the 'new improved' coupon on this page and you'll begin to get an idea of what we want you to do ...

First off, though, don't get worried if all you want to do is vote for your favourite five packages and nothing else. That's easy — just fill in the left-hand side of the coupon with the same details you would normally; this data will be used to create our chart as usual. However, now look at the right-hand side of the coupon — the exciting bit!

THE CHALLENGE

All we're asking you to do here is tell us your highest score for each of your five favourite games. All scores *must* be verified by a witness (who will need to sign the coupon before you send it to us), and accompanied by a small photograph of *you* — a black and white passport photo would be best! Of course, once we've got your photo, there's no need to send another!

Then, once all your scores have come in, we'll be telling you what the highest scores are for each of the games in the chart — alongside the face of the top five games players who've managed to wrack up the high scores. It would, of course, be very easy to 'fix' the chart by lying about your scores — but it won't help you! If you give a ludicrous score, it'll be checked ... and, if you achieve one of the two highest scores, you run the risk of being invited down to the *Y64* offices to prove it. And we're not calling the *Y64* Chart Challenge 'Who Dares Wins!' for nothing — we're looking for the best games players around — and it could be you!

THE WINNERS!

Those chosen to battle it out on the joysticks in the *Y64* offices will be pitted against each other on the game they claim to be so good at. We'll be talking to the players as regards their tactics, and consoling the loser with a bunch of software to walk away with. The winner, on the other hand, is elevated to the position of an official *Y64* games consultant — we'll be looking to this growing body of crack games players to 'second opinion' our major games reviews in future issues!

Obviously, some games are easier to work out a high score than others. Amassing a few thousand points in a 'shoot 'em up' game's far simpler to tell us about than your highest score in *Staff Of Karnath*; using the latter example, we'd be looking for a time before midnight (computer-time, that is!) that you managed to finish the game. But don't panic! We're getting everyone who's involved with *Y64* at the joysticks next month to give you some scores to aim for!

your 64 CHART CHALLENGE

Complete this coupon and send it to Chart Challenge, *Your 64*, 14 Rathbone Place, London W1P 1DE. (Make sure you include a B & W photo of yourself if you're going for the high scores!)

My top five games are:

1. ....
2. ....
3. ....
4. ....
5. ....

My top scores are:

1. ....
2. ....
3. ....
4. ....
5. ....

Independent witness.

Name ....

Address ....

....

....

Postcode ....

Occupation ....

Signature ....

And this is who I am ...

Name ....

Address ....

....

Postcode ....

Phone number ....

Signature ....

Stick your photograph here if you are going for the High Scores Chart

MUSICAL MATTERS

Avid readers of the Commodore 64 manual may have noticed its similarity to various telephone directories and bus timetables — you know it's crammed full of all the information you want, but is it really designed for human consumption? So, tossing the manual to one side, Keith Bowden *sets out to explain how to use the SID chip. Take it away, maestro...*

If you didn't know already, the 64 has the most sophisticated sound generating chip of any home computer. Making use of just 29 bytes of RAM ('registers'?, the SIF (Sound Interface Device) chip controls its synthesiser facilities, providing accurate frequency control of up to three voices simultaneously.

Not only that, but the SID chip provides four waveforms with pulse width modulation, programmable filters, synchronisation and ring modulation facilities. What more could you ask for? Indeed, these are all items you would normally expect to find on-board a digital synthesiser costing a good deal more than the 64!

The SID Chip

The SID chip registers may be split into five groups, as shown in the SID Chip Registers table. The first three groups of seven bytes control the frequency, pulse width, mode and envelope shape for each of the three available voices. The fourth and fifth blocks consist of four bytes each. Of the fourth, the first two registers control filter frequency, the third filter mode and resonance, and the fourth volume and filter shape. All the above registers are *write only*, that is they must be POKEd to control the synthesiser, but PEEKing these addresses generates meaningless results. Thus any current register values needed at a later date must either be saved as variables or stored elsewhere in memory. The last four bytes are *read only*. The first two read the values of paddle potentiometers connected to the control ports, and the last two give the current values of oscillator 3 (OSC3) and its envelope shape (ENV3). These can be used to dynamically control the three voices.

The SID Chip: Details of Voice 1 Registers

Register		
0	Frequency low byte	16 Bits
1	Frequency high byte	
2	Pulse width low byte	12 Bits
3	Pulse width high nibble	
4	Control Register (CR)	
	Bit 7 Noise on	
	6 Pulse on	
	5 Sawtooth on	
	4 Triangle on	
	3 Test bit (if noise locks)	
	2 Ring modulator on	Synchro-
	1 Synchronisation on	nised to Voice 3
	0 Envelope trigger	
5	Bits 4-7 Attack	
	Bits 0-3 Decay	
6	Bits 4-7 Sustain	
	Bits 0-3 Release	

Details of Filter Controls

21	Filter frequency low byte	11 Bits
22	Filter frequency high nibble	
23	Bits 4-7 Resonance	
	3 External	
	0-2 Filter Voices 1-3	
24	Bits 7 Voice 3 off	
	6 High pass filter on	
	5 Band pass filter on	
	4 Low pass filter on	
	0-3 Volume	

N.B. The groups of registers for the three voices are identical except that where Voice 1 is synchronised with Voice 3, Voice 2 is synched to Voice 1 and Voice 3 to Voice 2.

Notes and Frequency

To play a note on, say, Voice 1, the frequency registers must first be set. If the required frequency is FOUT then the following piece of BASIC will scale FOUT to the units required by SID, split it into its low and high bytes, and then POKE them into the appropriate registers.

```
FN=FOUT/0.06097
FHI=FN/256
FLO=FN AND 255
SID=54272
POKE SID, FLO
POKE SID+1, FHI
```

If the required note is to be specified by its musical name then the following code will give the required value of FOUT:

```
FOUT=2 ↑ (4+OCT+N/12)
```

SYNCHRONICITY

```
10 REM SYNCHRONISATION
20 A=5:D=10:S=15:R=12
30 OCT=5:N=0
40 L=2000
50 CR=16+2:REM TRIANGLE WAVEFORM,SYNCHRO
NISATION ON
80 SID=54272:FORI=0TO24:POKESID+I,0:NEXT
90 POKE SID+15, 5:REM VOICE 3 FREQUENCY
100 POKE SID+4,CR
110 FOUT=2↑(4+OCT+N/12)
120 F=FOUT/0.06097
130 FHI=F/256
140 FLO=F AND 255
150 POKE SID+24,15:REM VOLUME
160 POKE SID,FLO
170 POKE SID+1,FHI
180 POKE SID+5,A*16+D
190 POKE SID+6,S*16+R
200 POKE SID+4,CR OR 1:REM START
210 FORI=1 TO L:NEXT
220 POKE SID+4,CR:REM RELEASE
```

Our example program here produces a buzzing sound, rather like a 'rasberry'! You could try and make some different noises if you play around with the values in lines 40 and 210.

PULSE WAVE

```
10 REM PULSE SWEEP
20 A=5:D=5:S=15:R=15
30 OCT=5:N=0
40 L=255
50 CR=64:REM PULSE WAVEFORM
90 SID=54272:FORI=0TO24:POKESID+I,0:NEXT
95 POKE SID+24,15:REM VOLUME
100 POKE SID+4,CR
110 FOUT=2↑(4+OCT+N/12)
120 F=FOUT/0.06037
130 FHI=F/256
140 FLO=F AND 255
150 POKE SID+3,0:REM SET PULSE WIDTH TO
0
160 POKE SID,FLO
170 POKE SID+1,FHI
180 POKE SID+5,A*16+D
190 POKE SID+6,S*16+R
200 POKE SID+4,CR OR 1:REM START
210 FORI=1 TO L STEP 0.2:POKE SID+2,I:NE
XT:REM SWEEP PULSE WIDTH UP
220 POKE SID+4,CR:REM RELEASE
230 FORI=L TO 1 STEP-0.2:POKE SID+2,I:NE
XT:REM SWEEP PULSE WIDTH DOWN
```

This program produces a long flat note that eventually fades into the distance. Like the 'waa-waa' program, if you increase the value of L in line 40 the longer the note will be sustained; the lower the figure you introduce to line 40, the shorter the length of the note.

MUSICAL MATTERS

Where OCT is the octave number (0-7), and N is the note number (0-11), according to the following table:

0	C	6	F#
1	C#	7	G
2	D	8	G#
3	D#	9	A
4	E	10	A#
5	F	11	B

This assumes that Middle C is at 256 Hz (cycles per second). The formula is based on the relationship between consecutive octaves (2:1) and consecutive semitones (2↑(1/12):1). Thus the frequency of the C above Middle C is 512 Hz, and there are twelve semitones in an octave. The key of C (the white notes on a piano) consists of the sequence of notes:

. . . C D E F G A B C . . .

These are the notes that are harmonious to the ear when played together with the base note, C. Two notes sound in harmony if the ratios of their frequencies can be written as the ratio of two simple integers, but you will note that the ratios of the notes in our sequence all contain twelfth roots of two! Nevertheless, in each case a very close approximation to a harmonious ratio can be found. For example:

G/C = 2 ↑ (7/12)
= 1.4983 . . .
= 3/2

This is called a fifth interval.

Envelope Shape

The next step in playing a note is to set the envelope shape of the waveform. This has as much effect on the sound of a note as its frequency and, together with the timbre or overtone structure of the note, governs the instrument with which we associate a particular sound. SID gives the user control over attack and decay rates, sustain levels and the release rate, as in the diagram below.

The solid line represents the time for which, say, a piano key was depressed, and the dashed line the output volume. Initially, the piano string vibrates rapidly with a sudden burst of energy which, almost as quickly, dies down to a steady level, until the piano key is released and the note slowly fades out. The rise time of the note is given by its Attack rate, A, the fall time by the Decay rate, D, the volume by the Sustain level, S, and the time it takes to die out by the Release time, R. The appropriate values must be POKEd into the high and low bytes of registers 5 and 6 of the SID chip. The following expressions show the process:

```
POKE SID + 5,A*16 + D
POKE SID + 6,S*16 + R
```

Each of the parameters A, D, S and R is in the range 0-15. By setting the attack rate high (slow) and the rest of the parameters low we could achieve the effect of a piano note played backwards, such is the flexibility of the envelope commands.

Timbre

The timbre, overtone structure, or frequency spectrum of a note is its other major property. The way this is synthesised on the 64 is simple but effective. Three waveforms are available (other than noise). The triangular waveform contains only the odd harmonics (multiples) of the fundamental frequency of a note, and these are inserted in inverse proportion to the square of the harmonics in direct proportion to the reciprocal of the harmonic number. The pulse or square wave contains all the harmonics of the fundamental frequency, their proportion depending on the mark-space ratio (pulse width). By mixing these waveforms, and then filtering the combination, almost any overtone structure you desire can be achieved.

For Voice 1, the fundamental structure of the note is defined by setting bits 4-7 in register 4. Bits 1 and 2 control synchronisation and ring modulation. Voices 1, 2 or 3 are filtered by setting bits 0, 1 or 2, respectively, of register 23. Bits 4-7 hold a number from 0 to 15, which governs the resonance of the filter. Bits 4, 5 and 6 of register 24 switch on lowpass, bandpass and highpass filtering respectively, in any combination. The resonance governs the bandwidth of the bandpass filter (amount of medium frequency sound transmitted, 0 giving the least and 15 the most) and the rolloff of the other two filters. Bits 0-3 hold a number between 0 and 15 governing the overall volume of the synthesiser. The filter frequency is an eleven bit number held in register 21 and 22. Finally, if the pulse waveform is set, the pulse width can be set to any number between 0 and 4096 with the low nibble in register 2 and the high byte in register 3.

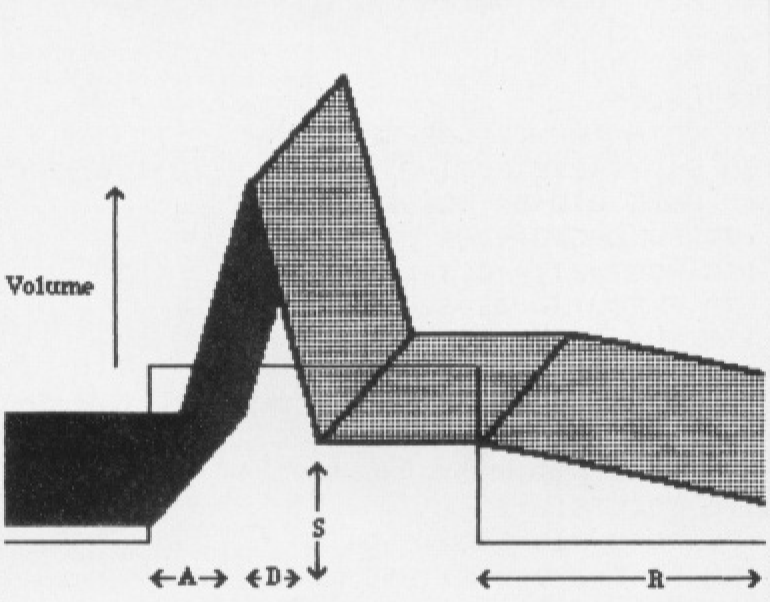
Playing a note

To actually play a note it is essential to do three things. Firstly, switch the gate of the control register off. For Voice 1 this is done with:

```
POKE SID+4,PEEK(SID+4) AND 254
```

Secondly, switch the gate on. This will start the note. It is equivalent to striking the piano key:

WAVEFORM ENVELOPES



Using the SID chip, you're given complete control over the attack rate (A), decay rate (D), the volume of the sustain (S), and the release time (R). Users can organise the sound output by POKEing the high and low bytes of registers of 5 and 6 of the SID chip with appropriate values of these parametes. In the above diagram, the solid line represents the time that a piano key was held down in relation to the output volume.

WAA-WAA

```
10 REM WAA-WAA
20 A=5:D=5:S=10:R=15
30 OCT=5:N=0
40 L=255
50 CR=16:REM TRIANGLE WAVEFORM (TRY NOIS
E CR=128!)
90 SID=54272:FORI=0TO24:POKESID+I,0:NEXT
100 POKE SID+4,CR
110 FOUT=2↑(4+OCT+N/12)
120 F=FOUT/0.06037
130 FHI=F/256
140 FLO=F AND 255
150 POKE SID+24,15+32:REM VOLUME / MODE
155 POKE SID+23,15*16+1:REM RESONANCE AN
D FILTER
160 POKE SID,FLO
170 POKE SID+1,FHI
180 POKE SID+5,A*16+D
190 POKE SID+6,S*16+R
200 POKE SID+4,CR OR 1:REM START
210 FORI=1 TO L:POKE SID+22,I:NEXT:REM S
WEEP FILTER UP
220 POKE SID+4,CR:REM RELEASE
230 FORI=L TO 1 STEP-1:POKE SID+22,I:NEX
T:REM SWEEP FILTER DOWN
```

Utilising a triangular waveform, this program produces a nice 'waa-waa' effect. Try altering the value in L in line 40 to change the noise output.



How to teach your Micro a thing or two

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POKE SID+4,(PEEK (SID+4) AND 254) OR 1

This will start the attack/decay/sustain cycle of the note. Finally switch the gate off again to start the release cycle (release the piano key).

Ring modulation

This effect can be used to create percussion sounds, bell tones, chimes and similar effects. It is a technique well known to electric guitarists and made famous by the late Jimi Hendrix. Ring modulation is a non-harmonic effect. It takes two input signals and outputs the sum and difference frequencies of the input frequencies. Notes that sound good together are related by ratios of simple integers (for example, the relationship between the frequencies of the notes C and G, a fifth, is 3/2). Two consecutive octaves have the frequency ratio 2/1. Music essentially works on a logarithmic scale (to the base 2), the note C in consecutive octaves having frequencies 128, 256, 512 Hz (cycles per second) and so on. Ring modulation, however, is a linear effect. If the two input frequencies are 200 Hz and 300 Hz the output frequencies are 100 Hz and 500 Hz, the difference and sum frequencies. If one input signal is held at a fixed frequency and the other one is stepped up the normal scale, the output signal (provided it is in the audible range of 20 Hz to 20 kHz) will consist of two signals, one stepping up a non-harmonic scale, and the other stepping down! The scale is non-harmonic because the difference in frequency of two semitones in the musical scale is related to the position of the two notes in the scale. The ratio of two consecutive semitones is always given by $2 \uparrow (7/12) = 1.4983 = 3/2$.

It is this superposition of a linear effect upon a logarithmic scale that gives rise to the non-harmonic effects mentioned above. Note that ring modulation only works with the triangle waveform set on the SID chip.

Dynamic effects

During the period in which the note is actually playing, any of the parameters can be changed. Thus, rapidly varying the volume of the note gives a tremelo effect, and rapidly varying the frequency up and down gives vibrato. (Note that the 'tremolo' arm of a guitar actually produces vibrato.) A slow change in frequency gives glissando. Changing the central frequency of the bandpass filter up and down the frequency spectrum produces the 'wahwah' effect well known to electric guitarists. Varying the width of the pulse waveform gives a form of the famous 'phasing' effect, which was originally produced by playing two identical tape recordings slightly out of phase. Varying the pulse width rapidly gives a remarkable non-harmonic effect. Lastly, synchronising Voice 1 to the fundamental frequency of Voice 3, or setting ring modulation (and triangle waveform) and sweeping the frequency of Voice 3 slowly up and down, produces a respectable imitation of the currently fashionable 'flanger' (which is actually a swept comb filter). Remember to switch Voice 3 off (unset bit 7 of register 24) when using synchronisation or ring modulation. Synchronisation bases the fundamental waveform of Voice 1 on Voice 3, effectively ANDing the two waveforms together. Many of these effects can be used simultaneously.

The simplest way to achieve dynamic effects is to increment a counter and POKE its value into, say, the filter frequency register, with the bandpass filter set, while the note is playing. This would produce the wahwah effect mentioned above. A more efficient method, particularly in machine code, is to use the oscillator and envelope values of Voice 3, (OSC3 and ENV3) available from the last two registers in the SID chip. All that is necessary is to PEEK the appropriate register (27 or 28) and POKE the result (or some value based on that result) into the appropriate register (volume, frequency, etc.) while the note is playing. Thus to obtain wah-wah we use:

POKE SID + 22, PEEK SID + 28

Which uses the envelope shape of Voice 3 to sweep the filter frequency up and down the frequency spectrum.

Noise

Noise can *not* be mixed with any of the other waveforms, for any particular voice, using the SID chip. If this is tried the noise waveform will 'lock out', until the test bit for that particular voice is set. White noise consists of all frequencies in the spectrum at once. Filtering produces 'pink' noise. Dynamically sweeping the filter frequency produces a dramatic rushing effect. Rapid attack and decay gives a cymbal-type sound which can be used in a rhythm backing.

The Finale

As you've probably gathered by now, the art of noise is not an easy one to master ... but it is a satisfying one! If you haven't already, do type in the example programs given here — yes, they're short and sweet, but if you've read this far you'll understand much more of the theory that went into their programming. (They're also a lot of fun!)

This article was taken from **The Companion to the Commodore 64** by Keith Bowden, published by PAN Books Ltd as part of the PAN/PCN Computer Library at £5.95.

PIANO

```
10 REM PIANO NOTE
20 A=0:D=9:S=0:R=0
30 OCT=5:N=0
40 L=1000
50 CR=32:REM SAWTOOTH WAVEFORM
90 SID=54272:FORI=0TO24:POKESID+I,0:NEXT
100 POKE SID+4,CR
110 FOUT=2↑(4+OCT+N/12)
120 F=FOUT/0.06097
130 FHI=F/256
140 FLO=F AND 255
150 POKE SID+24,15:REM VOLUME
160 POKE SID,FLO
170 POKE SID+1,FHI
180 POKE SID+5,A*16+D
190 POKE SID+6,S*16+R
200 POKE SID+4,CR+1:REM START
210 FORI=1 TO L:NEXT
220 POKE SID+4,CR:REM RELEASE
```

This listing provides you with a low-frequency piano note, complete with a saw-tooth waveform. You can adjust the length of the note by changing line 210; try 'FOR I=950 TO L: NEXT' and you'll find the note's shortened to the point that it sounds like a guitar note!

RING MODULATION

```
10 REM RING MODULATION
20 A=5:D=10:S=15:R=12
30 OCT=5:N=0
40 L=2000
50 CR=16+4:REM TRIANGLE WAVEFORM,RING MO
DULATION ON
80 SID=54272:FORI=0TO24:POKESID+I,0:NEXT
90 POKE SID+15,30:REM VOICE 3 FREQUENCY
100 POKE SID+4,CR
110 FOUT=2↑(4+OCT+N/12)
120 F=FOUT/0.06097
130 FHI=F/256
140 FLO=F AND 255
150 POKE SID+24,15:REM VOLUME
160 POKE SID,FLO
170 POKE SID+1,FHI
180 POKE SID+5,A*16+D
190 POKE SID+6,S*16+R
200 POKE SID+4,CR OR 1:REM START
210 FORI=1 TO L:NEXT
220 POKE SID+4,CR:REM RELEASE
```

This produces a sound similar to the alarm clock you throw across the room every morning! Just like the Piano program, you can alter line 210 to change the length of the note — but you can also vary the value of L in line 40 to get some stunning effects; try the following lines: '40 L=15000' and '210 FOR I=7500 TO L: NEXT'.

Y64 & COMMODORE

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To enter this competition, you've got to have composed or arranged a piece of music using Commodore's *Music Maker*. Your musical segment should be not more than five minutes long, and it'd be best if you sent it to us on cassette (or disk if you're feeling rich!). Of course, all cassettes/disks will be returned just as soon as the competition winners have been decided.

And what are we expecting you to play for us? Well, you tell us! You can come up with some wacky jingles, reggae, soul, pop, rock, opera or classical music — the tunes will be judged purely on their musical merit, so the ball's firmly in your court.

Judging the competition, we'll have a top-notch VIP from Commodore UK, one of the original programmers of *Music Maker* from Music Sales Ltd and, of course, the *Y64* Editor. Inspiration may take a while to take root and flower — especially if you're prone to the *prima donna* tantrums we've come to expect from modern musicians — so, you've got two months to get your act together. OK, it's 'get your vibes together' time and go for it ...

Win! Win! Win!

The best piece of music will win a brand-spanking-new Commodore portable SX64! Of course, everyone can't be a winner, but we're ready with prizes for 50 runners-up — so don't feel put off sending us your entries. Runners-up will receive *either* a cartridge three-pack of *Wizard of Wor, Gorf* and *Star Ranger* or all three Infocom adventures *Zork I, Zork II* and *Zork III*.

And don't forget, you've got until May 31st, 1985 ... so you've got time to make your entries really good! Send your entries to Music Maker Competition, *Your 64*, 14 Rathbone Place, London W1P 1DE.



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MAKIN' MUSIC

Here's my musical composition and it's called

....

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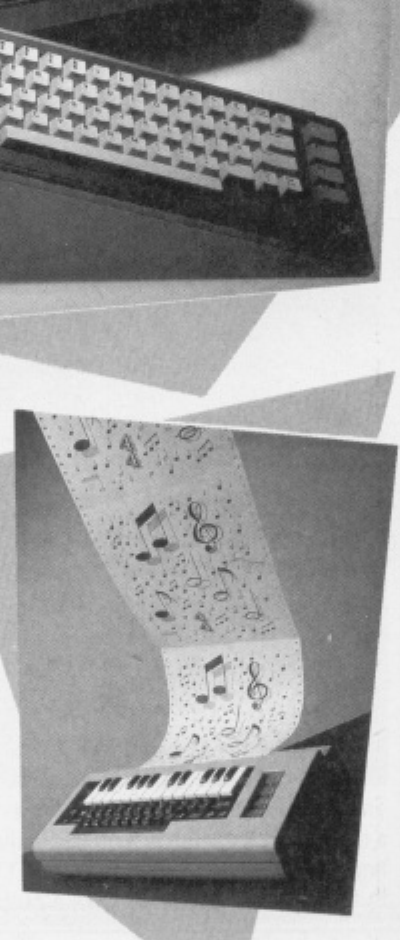
.... **Postcode** ....

Of course, if all you reckon my superb musical talents are worth is a mere runners-up prize, I'd like the cartridge three-pack/Zork adventure trilogy* (*delete as required).

Send your entries to Music Maker Competition, **Your 64**, 14 Rathbone Place, London W1P 1DE. All entries must be on cassette or disk, and should reach us not later than 31st May, 1985.

And On That Note!

If you haven't scored yourself a copy of Commodore's *Music Maker* yet (and you'll certainly need to lay your hands on the package to enter this competition!), it's available from all good computer stores and it'll set you back £29.95. For a comprehensive review of *Music Maker*, check out *Y64*, issue 6; any queries regarding *Music Maker*'s availability should be directed to Commodore on (0536) 205555.




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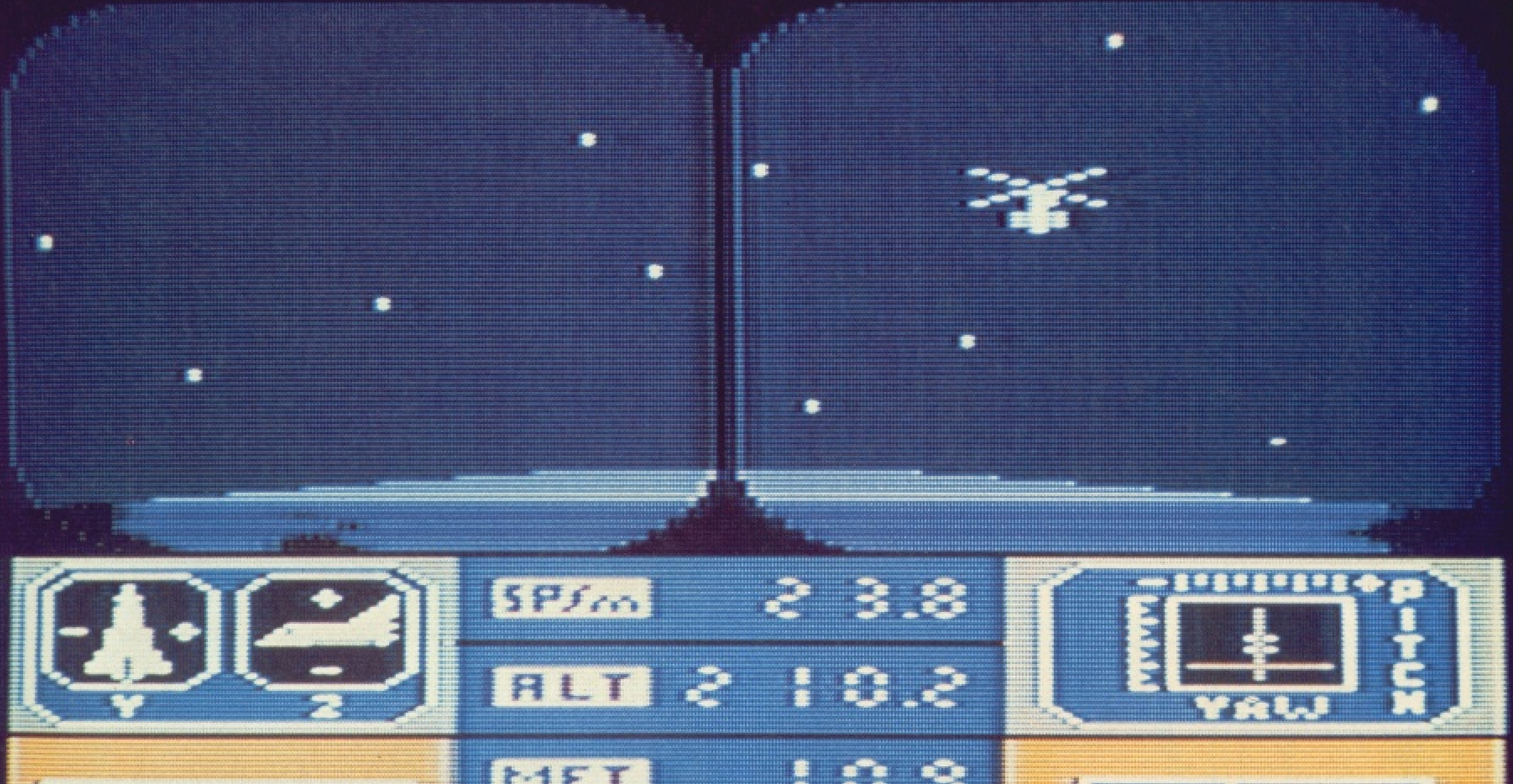
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SCRAMBLE!

Despite its name, this is not a game for bunglers! As Craig Rawstron *and* Sue Denham *find to their cost, Raid on Bungling Bay isn't just another 'shoot 'em up' affair, but a study of tactics ...*

Mark Watkinson

The first time out with *Raid On Bungling Bay*, you may think you're up to your eyes in yet another 'shoot 'em up' classic! But if that's the way you're going to approach the game long-term, you may as well forget it! Shooting planes and boats, and bombing the odd factory, might relieve a few frustrations you've got lurking around in your subconscious, but if you want to make your 'wings', you'll have to resort to ... tactics.

Chocks Away

Bungling Bay was a quiet little backwater on a planet somewhere in a remote galaxy ... until it was overrun by an empire of evil tyrants. Their aim? To destroy humankind ... as usual! To do this, they're constructing the ultimate war-machine, run by computers and robots, and defended by an almost impenetrable network of enemy guns, radar and ships.

The defences are, of course, 'almost'





Although you'll find the battleship is well-defended, it's still worth trying to halt its completion — once the battleship's launched, you may as well go and trash a few radar installations to up your score 'cause you won't have much longer in *this* game. By the way it's worth noting that once you've been shot down, there's still a few seconds before your chopper explodes — and you can still direct its movement ... just. Suicide pilots aren't usually encouraged in computer games, but if you're only a few seconds from death, try aiming your flaming wreckage at the battleship — you never know your luck!

The enemy has six factories, all busy constructing their war-machine. To blow a factory up it's best to fly over it, stop and then back up, you'll find you've got a lot more control when you're flying backwards! Once sure of your target, start dropping those bombs ... but don't be surprised if it takes more bombs than you've got on-board to destroy the factory, and do remember to make a note of where you are so you can rush on back and finish the job! Of course, bear in mind that once you've destroyed a factory, the enemy planes start taking off and things really start hotting up!

Before landing your chopper to refuel, it's worth checking the area for black bomber planes — there's nothing worse than being a sitting duck on-deck, just as a swarm of bombers just happen to fly overhead!

There you are, minding your own business, and you find yourself surrounded by enemy fighter planes. First of all, forget your bombs — just concentrate on blasting them with missiles. A good tactic is to wait for the planes to pass you, and then reverse back at full speed blasting as you go — the enemy planes seem to circle and don't realise what you're up to. But don't panic, you'll find that once you've mastered the chopper's controls, it's an easy job to manoeuvre out of the way of the enemy missiles.

Your aircraft-carrier's crammed to the gills with ammunition and bombs, which is good if your 'copters in the area and needs a top-up! To land all you have to do is pass over the deck, reverse up until you're directly over it and then hit the fire button. When you take off — following pretty much the same routine — you'll find your fuel level's at maximum, as is your bomb bay.

Once you've trashed three factories, you'll find that the gun emplacements get a little more deadly with their new ability to fire heat-seeking missiles. A heat-seeking missile, for those not in the know, defies all your attempts to dodge it as it'll just turn in a circle and chase you again. The best thing to do is to just get out as fast as you can! The only time it's worth hanging around to try and shoot a heat-seeking missile out of the sky is when your chopper's had some heavy damage and you're flying slowly.

Now the enemy battleship's launched, you don't stand much of a chance. Aside from scolding yourself that you should have devoted more fire-power to the battleship when it was languishing in dry dock, your best bet is to try and drop as many bombs on it as you can. You won't have much of a journey when you want to re-arm yourself as the enemy battleship always seems to make a beeline for your aircraft-carrier. The battleship's defences are extremely powerful and to be perfectly honest, you don't stand too much chance of survival. However, some nifty flight-work, precise pattern bombing and maybe the odd suicide mission into the battleship itself ... and who knows?

The enemy boats seem rather docile — except for when they try and ram your aircraft-carrier! It's pretty easy to shoot them out of the water using your missiles ... but there's not really much point unless it's a high score you're after. Much better, you devote more time searching out their big brother, the enemy battleship!

SCRAMBLE!

impenetrable because, as you might have guessed, it's your thankless task to halt the war-machine in its tracks.

When you first start, you're presented with a plan view of Bungling Bay — a number of islands scattered liberally in the ocean. You control a helicopter on an aircraft carrier and, once you've taken off, you're able to fire missiles and drop bombs; you're granted a limitless supply of missiles, but only nine bombs ... so use them sparingly.

All Mapped-Out

When you begin the game, it's worth sacrificing a few lives to fly around, building up a mental map of your surroundings; an on-screen arrow will always indicate the position of your aircraft-carrier should you need to re-fuel or pick up more bombs.

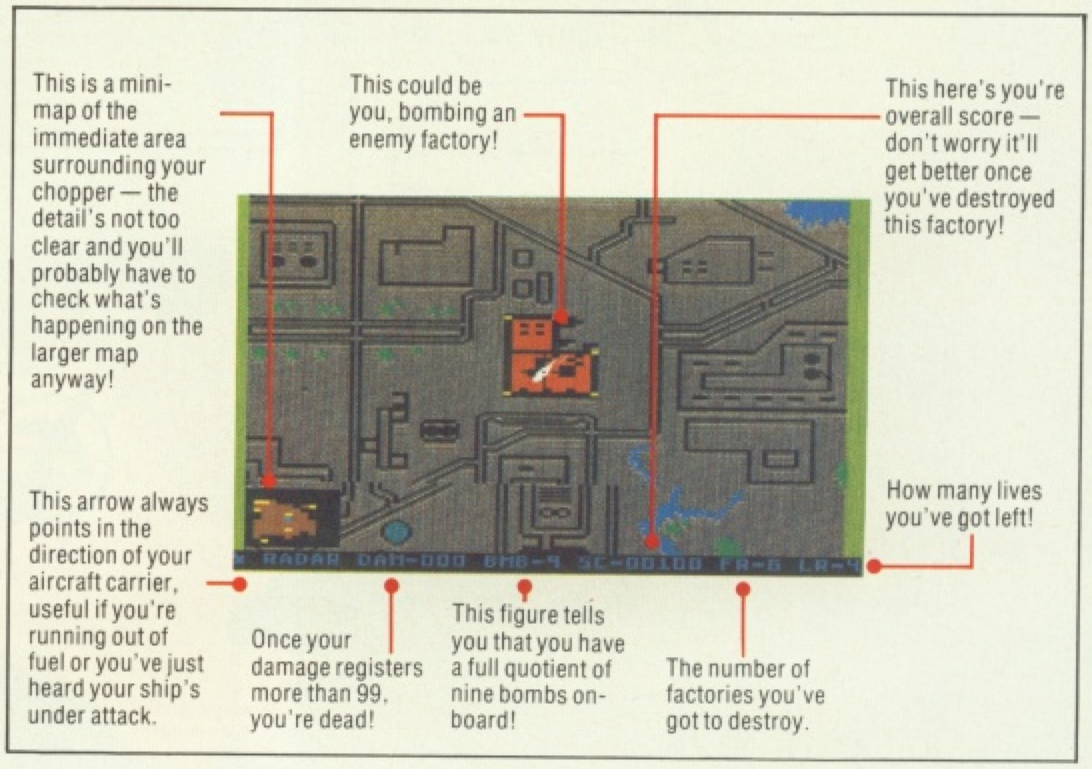
The first thing you'll notice is that there are quite a few guns sited on the islands that, guided by the radar installations, try and shoot you out of the sky. Avoiding these, you'll notice large buildings that are obviously the factories manufacturing the elements required for the war-machine; there are six factories in all, and you'll need to bomb each of them to destruction — this often takes more bombs than you have on-board, so don't expect too much from one raid.

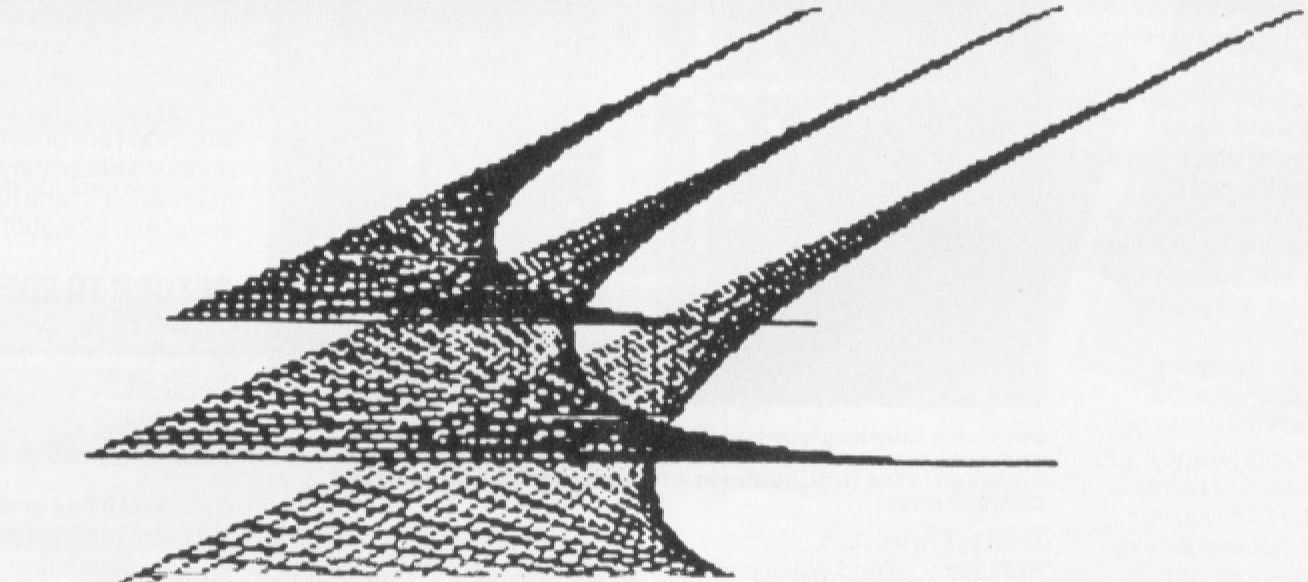
Of course, once you've destroyed a factory, the game itself takes on a new aspect — you'll be dogged by a number of white fighter planes, and your aircraft-carrier will be menaced by various black bomber planes. Nasty!

But that's not all ... destroy three factories and those mild-mannered gun emplacements start shooting off heat-seeking missiles at you! And if you thought your presence in Bungling Bay had so far gone undetected by the evil tyrants, you'd be wrong! While you're cruising around picking off factories and dodging enemy flak, they've been busy building a battleship ready to launch against your aircraft-carrier. You'd be well advised to check this out on your travels and blow it up before it's set against your meagre defences!

Tricks 'N' Tactics

By now, you've probably got the impression that there's no way to beat the game! Well, you're nearly right — it's not easy, but there's a few tricks and tactics we've given you that'll actually help you on your way ...





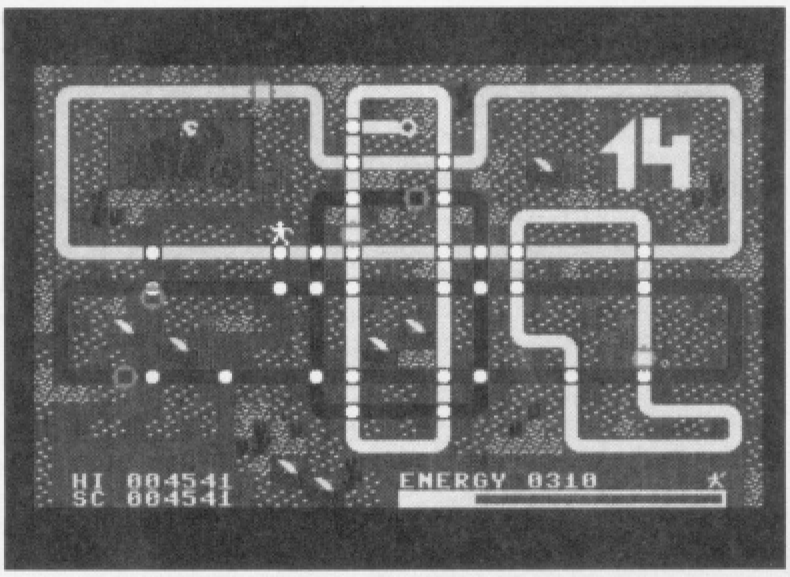
Calling all avid adventure gamers, read this page without delay! Why? Well, not only will adventure expert Jack Oats *be taking a good look at* Eureka *and* Return To Eden, *but there's the inception of the* Y64 Adventure Helpline *— and that's going to be involving* you*!*

EUREKA
DOMARK/£14.95

Cassette
one player
timings, arcade 2½ mins
advent 6½ mins

It seems as though home computer software is taking over where Fleet Street left off! Take *Eureka*, for example — this was launched with all sorts of 'hype' and a promise of £25,000 to the first person phoning through with the game's hidden message! Hmm.

Getting back to the game itself, *Eureka* is actually split into five different adventure components, each preceded by a rather uninspiring arcade screen. Playing this arcade game is mandatory — which will not please the *true* adventurers out there; indeed, the points gained here determine your fighting strength during the adventures. It has yet to be proved just how vital it is to get these vigour points — and if you do need thousands of points to get through, the £25,000 is pretty safe! It's not that they're difficult to beat — just very boring!



Domark's Eureka gives you five adventure games in one — and if you manage to crack the first four and find the hidden message in the fifth, you're in with a chance of winning the £25,000 prize!

The aim of the game is to find parts of a 'Temporal Talisman' which inadvertantly got transported through time and space when it was under analysis in the NASA space labs! The five adventures take place in Pre-Historic, Roman, 'Arthurism', World War II and Modern Times; you many only enter the fifth part having solved the preceding four! The graphics are of a chunky nature and very effective ... except that you're not able to turn them off! The occasional bursts of music are also very good, but those *can* be turned off!

The instruction booklet that comes with *Eureka* contains additional riddles in the form of verse, pictures and even the odd hidden code in the decorative borders(!). The instructions you're given are thin on the ground, but adequate. The game's vocabulary is not all that extensive and responses can be often very misleading ... be careful to ensure that you've tried obvious synonyms before giving up on your intended course of action!

It's best to cut your teeth on the WWII episode. This offers a greater chance of staying alive long enough to gain some experience of how the game functions. The program doesn't support a 'SAVE character' routine, so if you die you'll have to go through the whole thing again ... very tedious!

Eureka may not be of the best adventures that you'll ever come across (and the arcade interludes are ghastly!) but at under £3 each, they're certainly good value ... and just think about that £25,000!

RETURN TO EDEN
LEVEL 9/£9.95

Cassette
one player
load time 2½ mins

So, Level 9 has eventually succumbed to producing its first graphic adventure! And the company has done well — it's amazing what you can cram into the CBM 64's memory when you really try!

Although this is the follow-up to *Snowball*, it's not necessary to have completed (or even played!) *Snowball* to enjoy

Y64 ADVENTURE HELPLINE

Y64 ROUTINE ADVENTURES

I'm admitting failure with/probably the No. 1 expert on*

....

Here's my problem/tactical hint* ....

....

....

....

....

* Delete as applicable

Name ....

Address ....

....

.... Postcode ....

Phone ....

And I'll be there from .... (am/pm)

Complete this coupon and send it off to Y64 Adventure Helpline, Your 64, 14 Rathbone Place, London W1P 1DE.

Have you ever ended up stuck in a room full of locked doors ... only to find that the key was under the mat all the time? Annoying, isn't it!

Well, here at *Your 64*, we're looking to set up a 'write-in' service for readers who've sorted out the solution to a particular problem in a game. We'd also like to hear from anyone who wants help with various stages of an adventure!

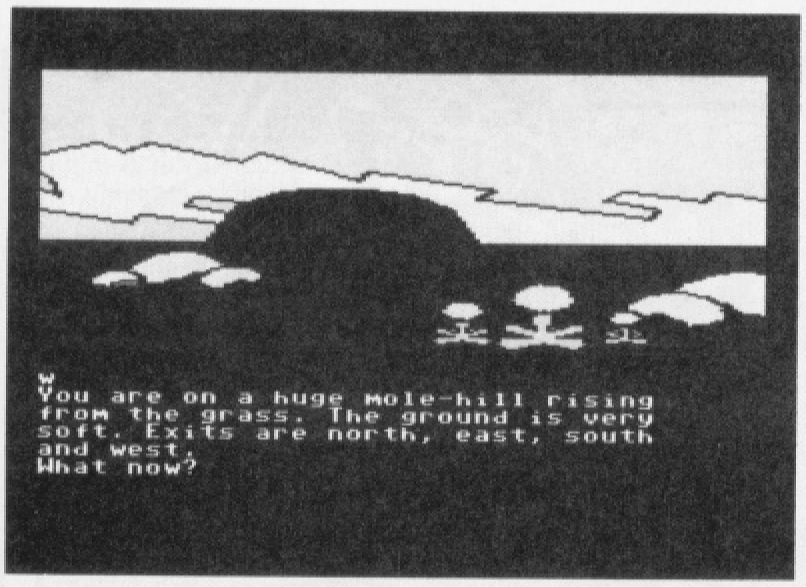
You'd be surprised how many letters we get from readers who've invested a tenner in an adventure, only to find they can't even make it out of the first location! Well, the first step is to phone up the manufacturer — companies are usually happy to help you out of any mess you get into.

However, if the publishers give you no joy, then that's the time to look to your fellow *Your 64* readers to give you a hand. Simply fill in the coupon on the left of this page and send it off to the address given. This way, once we've published your particular hassle, if another reader's already sorted out this problem, he or she will be able to ring you up and put you out of your misery. Who knows ... you could make a friend for life!

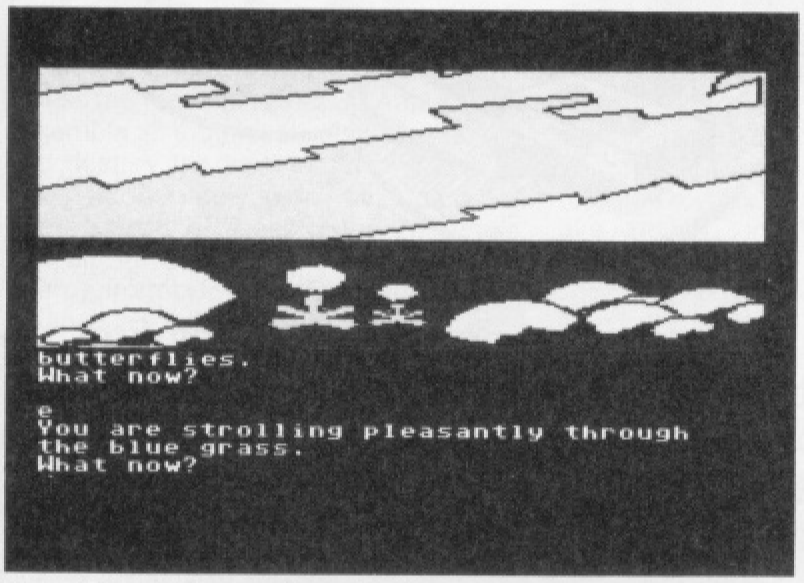
Of course, if you've cracked a particular adventure, you could offer to help any other readers solve their problems. Simply fill in the coupon below, giving a time that's convenient for people to ring you and that's all there is to it! If you're feeling shy, though, why not write and tell us your hints 'n' tips for an adventure and, if it's published, we'll send you one of the latest adventure packages on the 64!

Enthusiastic adventurers should write to the *Y64* Adventure Helpline, *Your 64*, 14 Rathbone Place, London W1P 1DE. Join me for some compulsive reading next month!

***MAGAZINE HEALTH WARNING** The use of scisssors on this coupon may be hazardous to this magazine's health — please use a photocopy instead!*



Return To Eden is not only the follow-up to Level 9's Snowball, but it's also the company's first foray into graphic adventures.



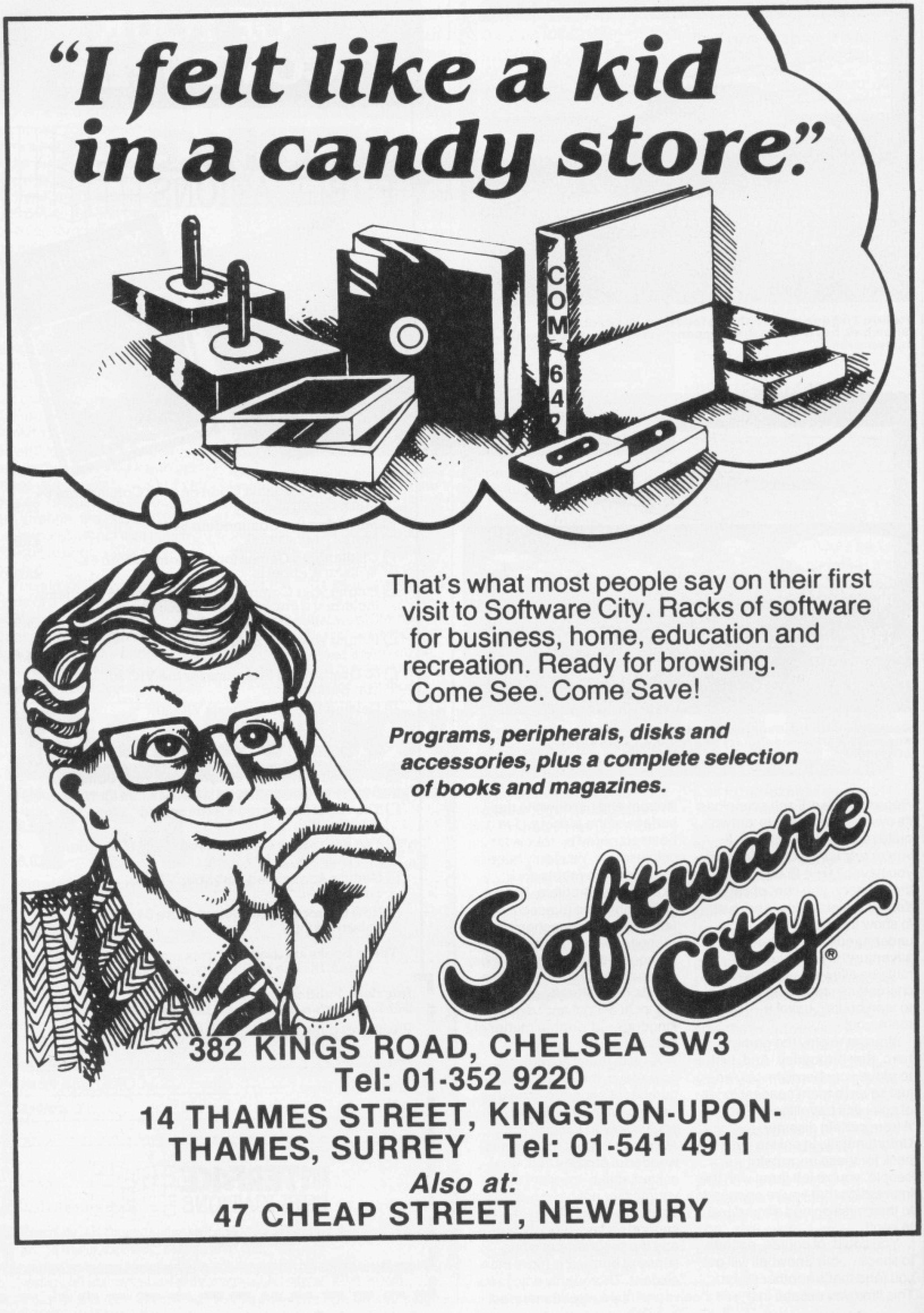
Complete with the usual wonderful puzzles, RTE supports a wide vocabulary and exhibits a great sense of humour!

Return to Eden. Each scene has its own picture which is 'drawn' quite rapidly to the screen. If you're retracing your steps and you haven't time to check out the scenery, you can, of course, turn off the graphics. And, just to show that Level 9 understands the frustrations of adventurers, it's included routines allowing you to save a character's status and position to tape or disk. Level 9 — we thank you!

You get to play the games hero, Kim Kimberley. And, just to prove your heroism, you've just saved a giant spaceship full of colonists travelling to Eridani A from certain disaster. Unfortunately, in risking your neck for these ungrateful people, you've left them with the impression that you're opposed to their mission and a murderer to boot!

You could, of course, escape to space ... but Snowball will get you (and that's another story!). This time you escape in a lifeboat and nip down to the surface of the planet which has been prepared by robots for colonisation. Your only hope is to contact the robots and explain your problem. But, as you might have guessed, the last thing these mechanical menaces want to do is relinquish their power to a mere human! You soon find out the robots have already alienated the local animal and vegetable kingdom — it's only a matter of time before they get you!

As with many adventures nowadays, this one's split into a number of separate scenarios — the next, only attainable once you've solved the last! And *Return to Eden* is full of those wonderful puzzles that, once solved, make you want to kick yourself for not having seen the solution earlier! The game supports a large vocabulary and the programmer's fine sense of humour is more than evident. Thoroughly enjoyable ... and highly recommended!


"I felt like a kid in a candy store."
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That's what most people say on their first visit to Software City. Racks of software for business, home, education and recreation. Ready for browsing. Come See. Come Save!
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It's unusual to find a game that combines the very best in arcade action together with the mind-numbing problems you'd find in adventure scenarios. But, as Ross Holman *and* Steve Broadhurst *find out,* Staff of Karnath *is just such a game! But then, what else would you expect from a company with a name like Ultimate!*

SPELL BOUND

Fitting firmly into the arcade/adventure category, *Staff Of Karnath* is Ultimate's first venture into the 64 software market. It's also the first game not to have appeared already on the Spectrum.

THE STORY SO FAR ...

The plot is a trifle complex — but, then, what game doesn't have an involved storyline these days? Apparently, there was once a powerful wizard, Karn, who managed to hide a magic staff with awesome powers deep within the bowels of his castle. You're told the staff's hidden in an obelisk ... but you can only open it with a magic key; the key comes in the shape of a Pentangle — a five pointed star to you! And to make life just that little bit difficult, it's split into 16 different pieces that are all hidden around the castle.

The hero of the piece, and perhaps set to become the 64's Sabre Man (a la *Sabre Wulf* and *Underwurlde* on the Spectrum), is Sir Arthur Pendragon. The date is April 30th — Wulpurgis Night to all you would-be devil worshippers — and the time is 6pm. At midnight, all Hell (literally!) will break loose! But, if you're following the plot so far, the idea is that Sir Arthur must assemble all the pieces of the Pentangle and destroy the staff just in the nick of time! Unfortunately, many hideous creatures guard the pieces of the Pentangle and all are capable of drawing the life energy from our hero. Sir Arthur's only defence is to be nimble-footed, or to cast one of the ten magic spells at his disposal. However, the correct spell must be chosen for each particular creature or it'll do no good at all. And, as each spell you cast decreases Sir Arthur's life energy by one (and he starts with 100 points), you'll have to learn the effects of each spell quickly if you're to survive!

ON DISPLAY

The screen display is so good that it warrants some good, old-fashioned enthusiasm. The player views the castle as if it were a doll's house, with the front of the house cut away; by judicious use of colour and shading, perspective is achieved in a very realistic fashion.

Using the joystick, you can move Sir Arthur left or right and, as it were, into or out of the screen; as he approaches the limits of the screen, the room scrolls smoothly with each further step to reveal more of the castle. The rooms are sometimes wider than one screen, sometimes smaller, and are separated by walls with doors — no surprises here. To open a door, Sir Arthur has only to walk up to the handle and — Open Sesame — it swings open; once Sir Arthur's passed through, the door slams shut. Open doorways are staircases leading up or down one floor while closed ones lead to the room behind. And, if you want to be really impressed, take a look at the contents of the rooms — especially the flickering candles and flame effects in the fireplaces.

STAFF PROBLEMS

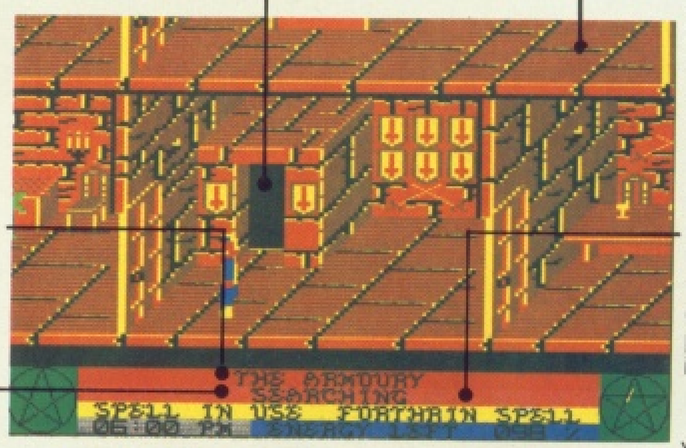
Tackling each piece of the Pentangle is a bit like playing 16 separate games — some pieces are won through the usual 'dodge and hack' methods associated with the arcades, others are a matter of being au fait with adventure games, witness the routine you have to go through to eke out the Pentangle piece in The Waiting Room.

You'll also have to watch out when you attack the nasties. It's often worthwhile hanging around outside certain rooms, selecting the correct spell — rather than rush in blindly, hoping for a lucky break!

The game itself can get a little tedious — the journey back to the obelisk does get a little repetitious after a while! But, all in all, *Staff Of Karnath* is easily one of the most compulsive games I've ever played. Even knowing where all the pieces are and the spells you'll need to collect them won't help you very much if you are planning on completing the entire adventure ... believe me, I've tried!

Now turn over for Y64's complete map ...

DUNGEONS AND DRAWING ROOMS ...



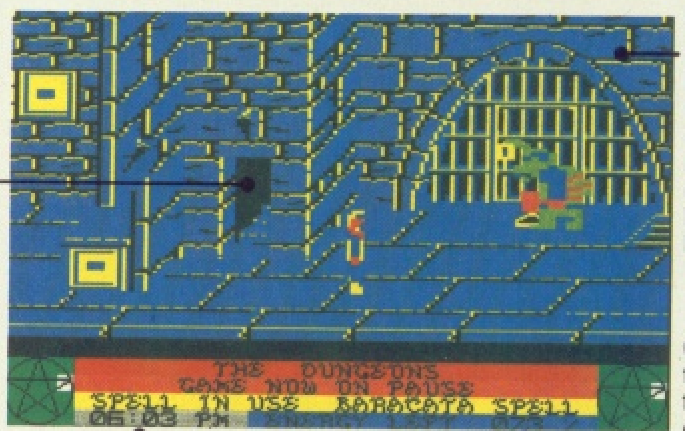
This is a door going down — you can tell because it's coloured in solid black.

A nice feature is that you can sometimes look in on the levels above, giving you a sneak-preview of what's going on!

This line tells you what room you're in.

Here you've engaged the Forthrin spell, which is your general all-purpose weapon in the Castle.

The word 'SEARCHING' tells you that you've still to find a piece of the Pentangle.



You'll know when you're in the Dungeons because the walls have been decorated in mauve, as opposed to the brown brick of the higher levels.

This doorway leads up to the next level; look closely and you can see the ascending steps.

You start at 6pm and you've got to collect all the Pentangle pieces by Midnight ... or all Hell's let loose!

When your energy level reaches zero, you're dead!

On either side of the screen, there's an outline of the Pentangle; notice here that you've already found one of the pieces.

THE COMPLETE MAP OF CASTLE KARNATH

THE NORTH TOWER UPPER
The doorway down to the North Tower Lower is protected by a force field, which will kill you if you try to pass through. However, if you blast it with the Stoly spell, you have approximately four seconds to get through the door.

THE BALCONY
The Balcony guard... monk, who marches ... along the corridor. T... three suits of armou... appear to do anythin... you walk past them! ... third knight deliver a... charge that'll stop yo... unless you have For... ahead of you act a...

THE TREASURY
Guarding the four treasure chests plus a piece of the Pentangle is a venom-spitting python. Liberal use of the Knossus spell sends it reeling to the ceiling, whereupon you can nip in under the beast and grab it.

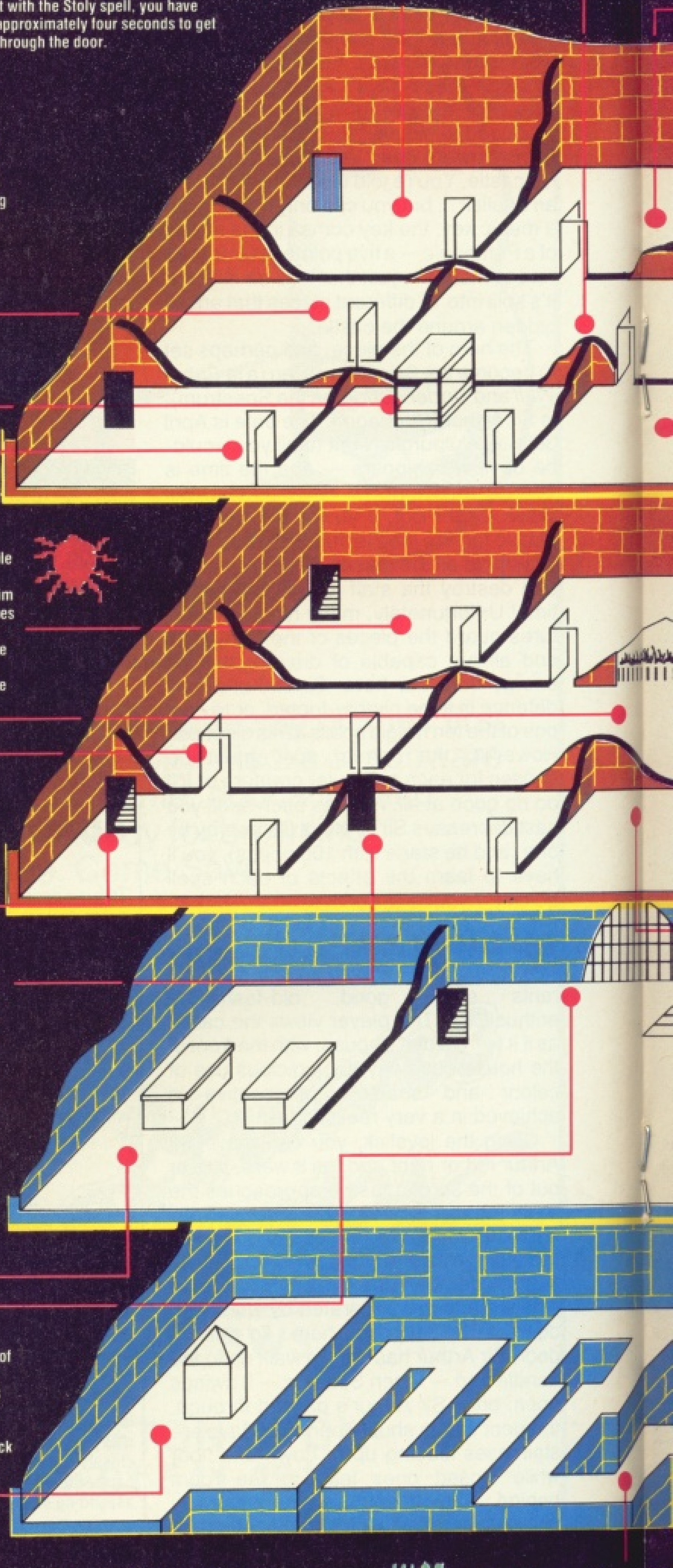
THE TIMELESS ROOM
Time goes crazy here — don't hang around too long or you'll find that it's midnight already! The trick is to position yourself at the right-hand side of the bedpost and select the Throbin spell. Then, as the carpet quivers, jump on and grab the Pentangle piece.

THE WEST TOWER UPPER
A pretty easy room, this! There's a 'baby' troll armed with a red hammer who's guarding the Pentangle piece, but with a little bit of clever footwork you should have no problem.

THE NORTH TOWER
You can't help but notice the 'orrible looking arachnid protecting the doorway. First up, select the Ibrahim spell and blast it — one shot induces the spider to let off a high pitched ping! This means that a piece of the Pentangle is now visible, having dropped from its hiding place in the cobweb in the Store Room.

THE GREAT HALL
The piece of the Pentangle is hidden cunningly in the flames of the fire — and, to prevent you burning your fingers, it's best to use the Aeulus spell.

THE SERVANT'S QUARTERS
There's not a lot in this room to interest avid adventurers. You can, however, easily avoid contact with the spook by walking carefully around the perimeter of the room.



THE ARMOURY
Doorways are used to move up or down a level. All you have to do is walk in and wait — but note that you'll have to tug back on your joystick when you make your re-entry ... or it's curtains!

THE WEST TOWER LOWER
Watch out when you enter this room as there's a rather nasty frog bouncing around the Pentangle piece; you'll find you can easily skirt around the monster if you're careful. By the way, cast your eyes up and you'll see another piece of the Pentangle in the West Tower Upper.

THE JAILHOUSE
There's a troll guarding this piece of the Pentangle. To grab it, get as close as you can and, as he moves away, blast him with the Ibrahim spell which will freeze him for a split-second. You'll have to be quick though ...

THE COFFINS
If you wander down between the second and third coffins, you'll hear an audible ping indicating that something magical has just happened. Dash as fast as you can for the place where you see the red skull on the wall.
If you 'ping' the coffins, you'll find that the skull has lifted to reveal another piece of the Pentangle. Trouble is, you'll find that it's a case of split-second timing — just grab for it and pray!

THE OBELISK
Pulsating with various runes, this is your spell depository. Each time you find a piece of the Pentangle, you have to make the perilous journey here to offer it to the obelisk using the Baracata spell, you cannot grab more than one piece of the Pentangle at a time, so you'll have to come here at least 16 times!

THE STAFF OF KARNATH
Once you've deposited all 16 pieces of the Pentangle, you'll come face to face with the staff of Karnath. The only spell so far unused in your magical armoury is the Menhir spell, so why not try using that. As we've yet to see the game completed, there's no guarantee that the Menhir spell will work!

THE GARGOYLES
There are two dra... carrying a lethal-... but you needn't m... you don't want to!...

Arcane architecture by Mark Watkinson

E BALCONY
Balcony is guarded by a mad nk, who marches relentlessly ng the corridor. There are also e suits of armour that don't ear to do anything at all ... until walk past them! The first and d knight deliver an electric rge that'll stop you in your tracks ess you fire a Forthrin spell ad of you to act as a shield.

THE MORNING ROOM
Try engaging the Ibrahim spell, and make sure that you've got the whole room on-screen. Now, get yourself to the left-hand side of the table, away from the annoying bat, and shoot at the flowers. You'll notice that after five hits, the bowl of flowers falls to the floor and turns into a piece of the Pentangle.

THE LIBRARY
When you grab the piece of the Pentangle in the Library, it all seems too easy ... and that's because you won't stand an earthly against the armed skeleton that comes along to grab it back! The way to beat this room is to blast the Pentangle piece with the Yerobas spell.



THE WAITING ROOM
Nothing much appears to happen here! Except, that is, if you hang around for about a minute. (The Waiting Room ... Geddit?) Then, a piece of the Pentangle appears above the fireplace just waiting for you to collect it.

THE EAST TOWER UPPER
Here you've got to go down to the East Tower Lower. Don't be put off by the large grinning skull guarding the entrance — just line yourself up, wait for the skull to start its upward motion and run for it!

THE SOUTH TOWER UPPER
Not a lot happens in this room ... but it's a good place to grab a few seconds respite from the carnage you'll find elsewhere.

THE EAST TOWER LOWER
Here you'll find another skull, this time moving horizontally across the room. The tactic to use here is to wait for the skull to move out of the way, rush behind it, grab the piece of the Pentangle and hightail it!

THE UPPER GUARD ROOM
There's a piece of the Pentangle lying on the floor, but there's also a witch on a broomstick to protect it. You can dispatch the witch for a few seconds using the Forthrin spell ... but be quick! You'll also notice that there's a shield hanging on the wall providing the key to grab the goodies in the Laundry on the floor below. The trick here is to fire a Throbin spell at the shield, the cross then drops on the floor — now select the Umphalus spell which enables you to pick it up. Now, it's exit stage right and zip off to the Laundry.

THE STORE ROOM
When you first walk into the Store Room, if you've got a good monitor you may have noticed the outline of the Pentangle piece in the cobweb. This will only fall to the ground, if you shoot the spider in the North Tower Lower.

THE LAUNDRY
Once you've found the cross, the vampire slides obligingly to one side, allowing you entry. Once inside, grab the piece of the Pentangle as quickly as you can ... as there's another vampire inside forming the reception committee.

THE KITCHEN
It doesn't say much for the food around here, but the Kitchen's inhabited by energy-draining bats. The Pentangle piece can be picked up using the usual 'rush in and grab' technique.

THE SOUTH TOWER LOWER
The Laundry is protected by a deadly vampire who refuses to get out of the way no matter what spell you cast on it — and, if you walk towards it, you'll find yourself thrown back by a magical force! To enter the room, go and get the cross from the Upper Guard Room.

THE DUNGEONS
This is the entrance to the Abode of Khan and it's protected by a white skull with a denture problem.

THE LOWER GUARD ROOM
This is where you start your quest ... and keen eyes will notice that Ultimate has been kind, providing your first part of the Pentangle lying on the floor. It's not that easy though, as it's protected by two knights.

THE ABODE OF KHAN
As soon as you emerge from the doorway, watch out for the birds that drop high-explosive eggs on your head!

IE GARGOYLES
ere are two dragons, each rrying a lethal-looking trident ... t you needn't mess with them if u don't want to!

THE WALKWAY
As you negotiate the walkway, you have to watch out for the arrow-spitting gargoyles on the walls.

SIR ARTHUR'S MAGICAL ARMOURY
This here's a rough guide to the spells Sir Arthur's got at his disposal, and how to make the best of them. You may find, however, that collecting the Pentangle pieces is often just a matter of waiting until the nasties have their back turned, rushing in and grabbing them!

FORTHRIN	Dragons, Ghosts, Bats, Mad Monk, Knights, Vampire, Flying Axe, Frog, Baby Troll, Witch
IBRAHIM	Big Troll, Green Spider, Pot of Pansies
THROBIN	Magic Carpet
UMPHALUS	Shield
STOLY	Force Field
YEROBAS	Skeleton
KNOSSUS	Python
BARACATA	The Obelisk
MENHIR	The Staff
AEULUS	The Flames (in The Great Hall)

ACTION REPLAY

No. of players | Joystick | Joystick optional | Cassette | Disk

Joystick junkie Steve Malone *settles down to tackle the latest and greatest games software for the CBM 64. Won't you join him?*

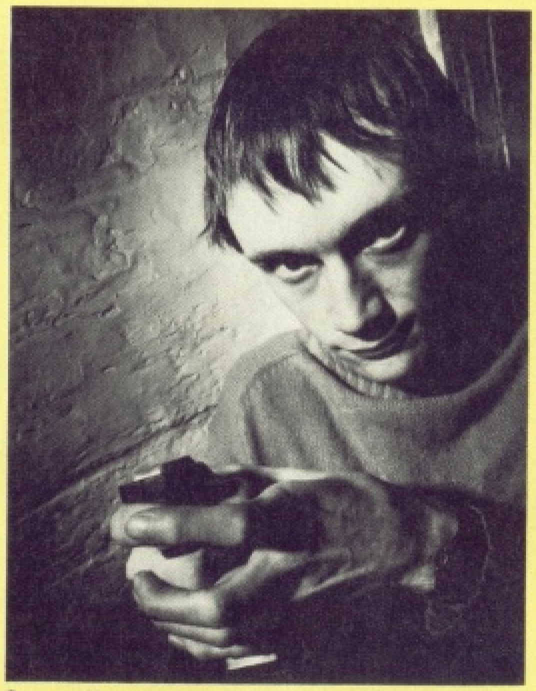
Welcome to this month's *Action Replay*, only to find me wading through the mass of cassettes that never quite made it to the review pages that follow.

Amongst the also-rans was *Shoot The Rapids* from New Generation Software. The idea here is to paddle your canoe through a load of gates, while avoiding such obstacles as rocks, motor boats and Beavers (!) — and all this against the clock. One uncharitable soul around the *Y64* offices suggested that the programmer should be shot ... but I wouldn't be so unkind.

Audiogenic's *Alice In Videoland* has been available on disk for quite some time, and now it's finally managed to drag itself on to cassette. Based more or less on Carrol's *Alice In Wonderland* book, there's much falling down rabbit holes, drinking from magic bottles and playing of croquet. It's both extremely pretty and rather gentle — don't, expect a cardiac arrest from this one!

For quite a while now, someone has been bombarding the *Y64* office with verbal graffiti on *Eddie Kidd's Jump Challenge*. We've had posters, stickers, press releases — the lot! All that's left now is for Eddie Kidd himself to turn up on the doorstep! It's a shame the game itself isn't as entertaining as the promotion ... on yer bike, Eddie!

Melbourne House's popular hero (it says here) Horace reappears in a game called *Hungry Horace*. And yes, yet another programmer bereft of good ideas has decided to dig up the rotting corpse of Pacman and feed him his energy pill for just



Steve 'Psycho' Malone — Action Replay supremo!

one more shake. To be fair, *Hungry Horace* is trickier than yer average *Pacman* clone, but does anyone care? (*Answers on a postcard, please. Ed.*)

Gilsoft has released a series of adventures based around its *Quill* adventure writing utility. These are: *Africa Gardens* (set in a hotel); *Diamond Trail* (set in a city); *Spyplane* (set in enemy territories); *Magic Castle* (set in a, wait for it, castle); *Mindbender* (set in who knows where); and *Devil's Island* (set on an island).

We've had a whole hoard of mini-ancients emerging blinking into the cold light of day in the *Y64* office. And it seems that Avalon Software is responsible for most of them! *Snap* and *Pontoon* are unpretentious little games for those too bone idle to shuffle a pack of cards, and *Fruit Machine* is OK for others too lazy to pull a handle. But for those whose bank balances wouldn't allow them through the door of a Monte Carlo casino, there's *Roulette* from No Man's Land (a French company naturellement!); it seems a mildly amusing way of not losing thousands of pounds. To be frank I didn't expect much from any of them ... so I wasn't very disappointed.

Over now to the 'old games never die, they just get re-written' department. *Titans* from Romik Software is a game set in ancient Greece that has you hanging for dear life on a flying horse, trying to cope with all kinds of mythical monsters. Funny, but I'd swear it looks just like *Defender*, only with different sprites. Still, the action's fast and furious!

Finally, a word or two about British Telecom's own (cheapo) Firebird Silver label. *Mr Freeze* is only £2.50 — and at that price, it's worth the money; it's entertaining enough, especially seeing Mr Freeze's delightful walk. However, if you're not a shareholder of the company and can afford a bit extra, I'd suggest you look elsewhere.

QUESTPROBE/SPIDERMAN

Adventure International/£9.95

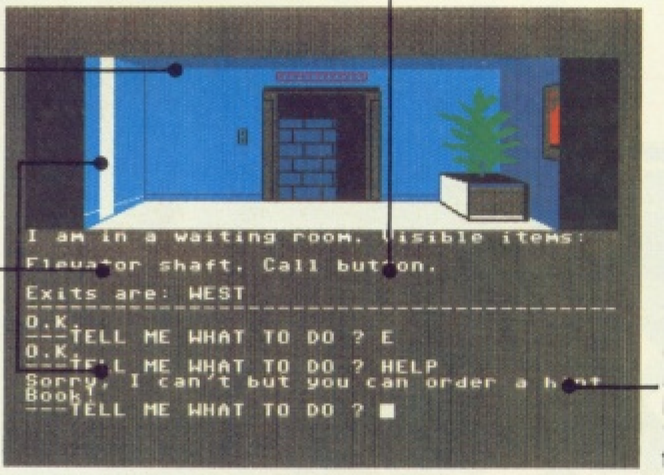
Hi there, true believers, how about a little web-slinging? Yes, it's time to tune in to the second adventure in a 12-part series starring the Marvel comic book characters we all know and love. Part one concerned the death-defying antics of the Incredible Hulk ... and now it's the turn of Spiderman.

We're told there's a common theme running through all adventures — apart, that is, from the constant plugging of Marvel Comics (Stan Lee was never a man to undersell himself!). On a far and distant planet, countless light years from Earth, a bunch of philosophers are running into trouble. They're being attacked by heavies, calling themselves the Black Fleet, and our merry meanies are hell-bent on success. The problem is, these philosophers are a peaceful crowd who've forgotten how to fight — all, that is, except one who is busily hoarding the powers of all the various super-heroes, rather like some interstellar butterfly collector. The object of the adventures is to somehow work out why.

In the meantime, however, it's a question of wandering the offices of the Daily Bugle and encountering Spiderman's best known enemies — Spidey's greatest hits you might say (*Or not, as the case may be! Ed.*). Apparently, everything hinges around a

The graphics are drawn very well, and accomplish the task of making the game very similar to reading a Spiderman comic book.

Like Gaul, the screen is split into three! The top section contains the graphics, the middle bit spews forth the information on what's happening and the bottom part of the screen is left clear for your commands.



Pressing the call button for the elevator will do you no good at all!

This adventure allows you to make use of a very large vocabulary of commands — which means you don't spend the first half-hour of play wondering how to pick up an object! Replies are generally helpful or 'smartass' — there's a 'hints' book available, but only if you write to New York.

bio-gem, a piece of which has somehow turned up on earth.

This is the sort of adventure I like. Good graphics, friendly-ish vocabulary and a subject I know something about. Packed in with the adventure is a comic book which bears a passing resemblance to the on-screen action; it doesn't actually give any hints ... but it does point you in the right direction. All in all, another game where the Yanks have shown us Brits how it should be done.

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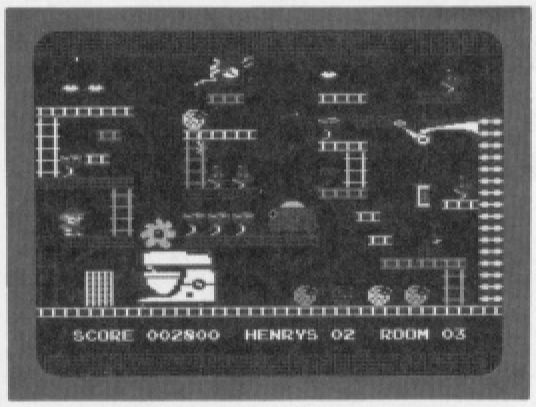
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HENRY'S HOUSE
English Software/£8.95



Following the birth of the latest royal sprog, software houses, who know a passing bandwagon when they see one, have begun producing games based around the antics of Chas and Di (witness Microdeal's *Di's Baby*). *Henry's House* is an exceedingly pretty little game in which our royal hero ventures forth to explore the palace, meeting all manner of strange things on the way.

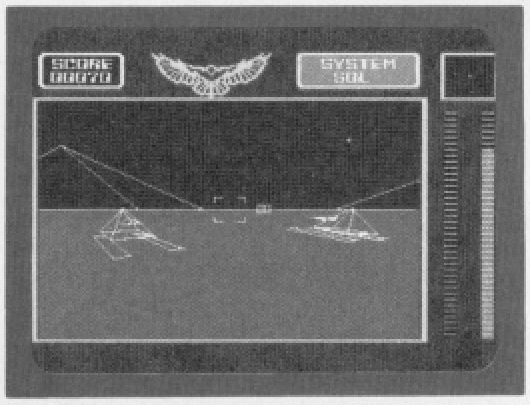
Henry's House is another of those endless platforms and ladders games that have you feverishly picking up any number of unlikely objects in room after room — while avoiding the ghastly things that go bump in the night.

There are eight rooms to explore in *Henry's House*; these range from the Clothes Cupboard to Henry's Creepy Dungeon. As in most examples of this sort of game, there's a right way to go about collecting things without running into trouble, and there's a wrong way! The trick is, of course, to work out the right way!

In this job, it's easy to become jaded. If I see just one more version of *Jet Set Willy*, I'm going to have to reach for the Power Pills. Except ... this just happens to be one of the best games of its type that I've seen for many a long day.

Having starred in such an unexpected winner, I daresay Lil' Henry will now be given his own series. A star is born!

STELLAR 7
US Gold/£9.95



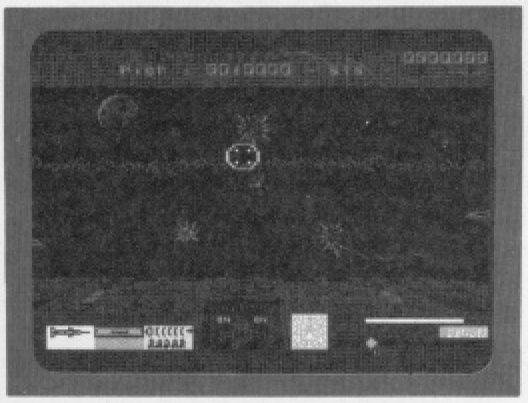
Remember *Battlezone* ... the arcade game that has you battling with the spectral outlines of tanks and where you are forever advancing on mountains which never actually get any nearer? Well, *Stellar 7* is just like that — and what a coincidence, I hear you say.

The difference between this and *Battlezone* is that here you are fighting your way to Arcturus to intercept the evil Gir Draxon. To get there you have to ensure the dispatch of the ten or so enemy tanks, satellites, planes and so on that get in your way. Perm any two from three, zoom above the correct score and, hey presto, a bright and shining star-like object will appear; all together now ... Aaaah.

So ram it! This simple action will hyperwarp you through to the next star system (it's easy to tell, the sky looks different) where more outlines wait to do nasty business with you. And so it goes on. Crash your way through seven stellar systems (hence the name, geddit) and you have reached Arcturus.

Actually, I find the trick with these sort of games is to aim ahead of whatever it is you're gunning for; these boys move much faster than you can. Assuming you have the knack, you'll find *Steller 7* fairly easy to play (at least at the lower levels), and it's a game that will bring tears of nostalgia to those who mispent there youth in the seventies arcades.

3D LUNATTACK
Hewson Consultants/£7.96

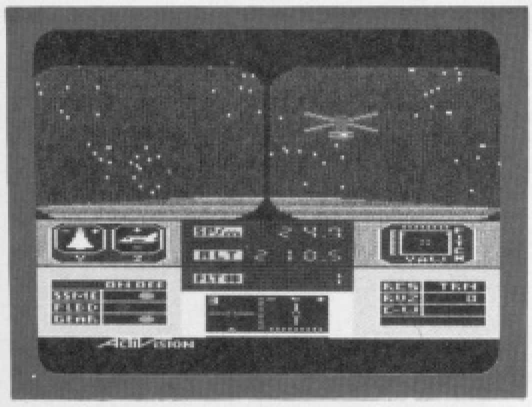


Meanwhile, back at the 3D 'shoot-em-up' we have *3D Lunattack* from Hewson Consultants. And — holy galaxies — it appears that a bunch of aliens known as the Seiddab (that's baddies backwards — geddit?) have invaded the moon; as the commander of a squadron of lunar fighters, it's up to you to destroy their base and save civilisation (*Yawn, do I have to today? Ed.*).

To aid the brave pilot in the fight against the alien menace, there are any number of assorted weapons and controls at his or her disposal — missiles that blast and lasers that fry. And you get a map that shows you're going, and a navigation computer. I must say I found it tough getting the hang of this one. The aliens tend to come over the horizon and, although you think you've got plenty of time to draw a bead on them, the gunsight is actually awfully difficult to control (which might, of course, just be *my* problem). Another problem of mine is that I like to be told what I'm supposed to be looking for. I spent the first thirty seconds shooting up moon craters before realising what they were! Flying the moon buggy is fairly easy, although the aliens seem to have a lot more zip and, once they appear, it's pretty difficult to avoid them.

For once, the graphics actually live up to the blurb on the case and the moonscape is drawn in very good high resolution.

SPACE SHUTTLE
Activision/£9.99



The latest contestant in the flight simulator stakes that stands ready for your admiring glances is *Space Shuttle* from Activision.

First of all, don't be put off by the manual that takes you three hours to read (which usually means you need a Doctors degree to understand it); in fact, the controls are fairly straightforward. Your mission is to rescue a satellite that you probably put into the wrong orbit in the first place.

With one eye on the appropriate chapter, it's fairly easy to blast off (it's amusing to fantasise real NASA astronauts using one of these step-by-step manuals!). But ... once in orbit, you'll find that locating the satellite and docking with it is quite another matter. To hit the correct speed and altitude simultaneously is something of a real feat — because of the trade off between the two. And don't get too smug if you achieve it ... remember there's still the minor problem of landing the shuttle without ending up at the bottom of a multi-billion dollar hole.

The graphics are done professionally, although they're nothing to write home about! I particularly liked the way the Earth and sky changed colour as you moved in and out of the sunlight; the sky also begins to get ominously dark when you begin to drift too far away from the planet.

Space Shuttle is really quite addictive, particularly when the chase is on to catch the elusive satellite. I doubt however, whether this is an accurate simulation,

BLUE MAX
Synsoft/£9.95



In this month's simulation corner we have *Blue Max*, a goggles and flying helmet number from Synsoft.

Originally written for the Atari, *Blue Max* is one of those *River Raid* sort of games where you take off, bomb some curious looking guns and buildings on the ground, shoot the occasional sprite — and then land again ... I'm afraid there's not much exploration. A sort of circuits and bumbs affair that sounds simple enough.

Well actually, no! For one thing, I might be old fashioned, but when I pull the joystick back, I expect to go up — not crash into the ground (and, yes, I did have the joystick round the right way). It would have been nice if Synsoft had told me it'd moved the goalposts *before* I'd destroyed some 20 aircraft on take off. I mean, you feel such a fool!

Anyway, once airborne you flit around the circuit causing mayhem for King and country. The buildings are easy enough to deal with, as are the tanks (or are they tanks?); but the moving trucks are more difficult, not to mention the enemy aircraft. It's rather a pity you can't engage the 'Laudits in dogfights' (as we flying buffs call it) ... all they do is fly off the screen — damn cowardly I'd call it.

The graphics and play of *Blue Max* are similar to what you'll find in *Zaxxon* — and, to be frank, I'd recommend you buy that instead.

FRED
Quicksilva/£7.95



Yet another product to roll off the seemingly endless Quicksilva production line — and this time it's a re-working of the Spectrum favourite. The question is ... why has it taken so long to arrive for the 64? After seeing so many other programs of this type on the 64, one could be forgiven for thinking that *Fred* is a direct rip-off ... apart from the fact that *Fred* came first!

Anyway, back to the game itself. As Fred the explorer, you pick your way through a load of catacombs by shinning up and down ropes, picking up treasure as you go. The catacombs are inhabited by ghosts, skeletons and mummys and, when you run into them, part of your energy ebbs away; guess what ... run out of energy and you're dead! You are armed just with a gun which, though it has little effect on the ghosts (which drift through walls à la Pacman), is useful against the mummys and skeletons. However, as a nod towards realism your gun has only six shots in it, so it's advisable to go easy on the fire button. Mind you, providing you can keep control of the joystick, it's probably just as easy to outrun the nasties and dive out of the way — as they don't seem to chase you anyway!

Once you've collected all the Egyptian bric a brac that's lying around there's the small problem of getting out. You can do this by locating a grill in the maze and blowing it out with the handy bomb you're supposed to have found on your travels.

CAESAR'S TRAVELS
Mirrorsoft/£7.95



Caesar has been caught smashing up the larder by his owner Mr McGregor and the nasty man decides that our feline hero is uneconomic, not to mention redundant. Caesar must now go forth and 'scratch' a living from the big wide world.

The big cat never gets bored as he travels around. He gets chased by dogs and parrots, gets stuck in car boots and dustbins, meets unfriendly butchers, fishmongers, witches and much, much more. In fact, he's quite the little action cat!

Caesar is guided on his adventures by the Function and Return keys, each of which has a different command, such as 'Hide' or 'Jump'. And every so often he's asked an educational-type question like 'How many cats?' or 'Which is the biggest fish?'.

The screen is divided up into two parts: the top telling the story of the trials of Caesar while the bottom is an animated graphics screen which acts out the action.

Some among you may be wondering why this game's being reviewed rather than some brainless 'shoot 'em up' — well, *Caesar's Travels* has a quality which makes most 'grown-up' adventures look like the half-baked bilge they actually are! The story's interesting, the graphics are great and the sound isn't at all bad either.

Buy this one for a younger brother or sister and I'll bet you end up playing it yourself!

CHOPLIFTER
Ariolasoft/£9.95



If you want to see the 'biggie' from Ariolasoft, take a look at the *Y64* review of *Raid On Bungling Bay*. But it seems the game was so successful that the company's wasted no time in releasing its follow-up.

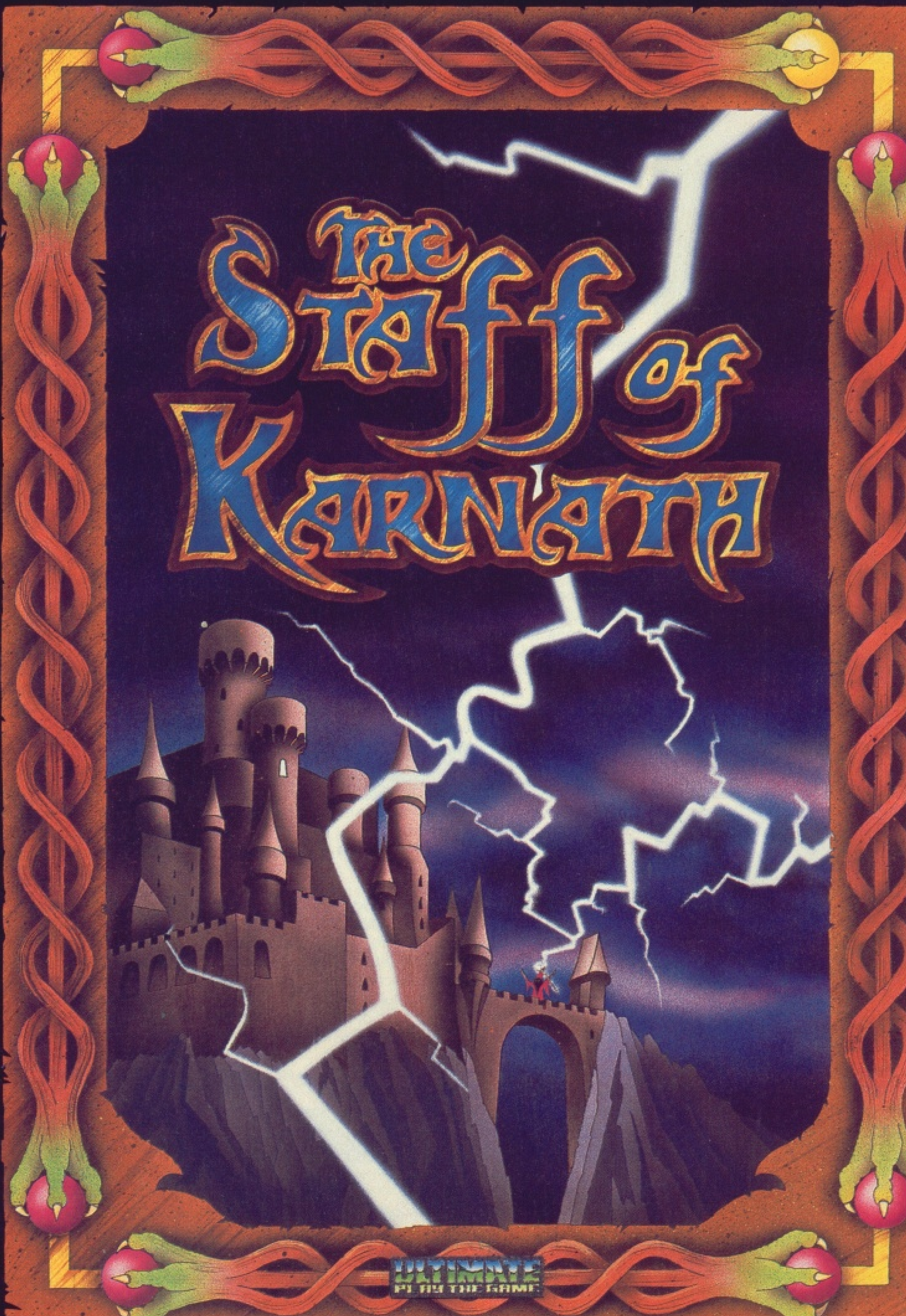
In many ways, *Choplifter* is similar to *Raid*, especially as it seems that you're once again piloting a helicopter against the Bungelings in the name of the good ol' US of A. This time, however, the object is to rescue a group of hostages who have been kidnapped by the Bungeling Empire.

The 64 prisoners are being kept in what looks like miniature Swiss cottages and, when you land, they emerge, wave their arms about and gratefully climb aboard. Naturally, the Bungelings take offence at this and they lose no time in dispatching a bunch of tanks after you. The best way of dealing with them seemed to be to pattern bomb the whole area!

As with *Raid*, the first level is fairly easy, while the second is getting on for impossible. Once you've delivered the first load of hostages (the chopper only takes 16 at a time), things really start to get out of hand. Suddenly, you're beset by jet aircraft and floating mines, and the pathetic little pea-shooter that passes for your weapon hardly seems adequate.

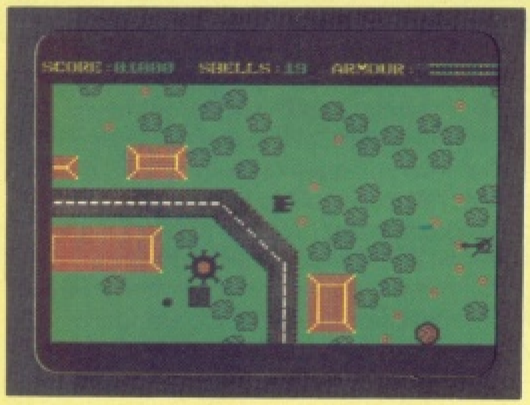
Although not as good as *Raid*, this game's alright, and the concept is as good a 'shoot 'em up' as you'll find anywhere.

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FRONT LINE
Interceptor Micro/£7.00



Here's a sort of ground level version of *Blue Max* that has you meandering around, blasting away at anything that moves.

The year is 1984 — although you wouldn't know it from all the jets and helicopters the enemy throws at you — and you're in control of an experimental battle tank that charges around the countryside doing battle with anything that raises its alien head.

The map depicts your heroic actions is the usual kind of flat greenery and carefully winding rivers and roads so beloved of games programmers. Things to avoid while you're rolling along are the mines, the octopus-looking forts which you can't damage (but they can hurt you) and the fireballs which seem to have a magnetic attraction to your metal exterior. Apart from that, anything else is fair game.

Easy, you may say. Ha! The trouble is, the programmer has included an unusually mean feature. You fire a shell by pressing the fire button but it won't actually explode until you let go again! You've not only got to aim the darn' thing at a moving target, you also have to judge when the shell has to explode. That's not easy, especially if like me, you're used to just stabbing away at the fire button.

Front Line is not the best game I've ever seen but it *is* engaging and a lot more fun than most of the other stuff around. It's also pretty difficult to master.

GANDALF THE SORCEROR
Tymac Software/£9.95

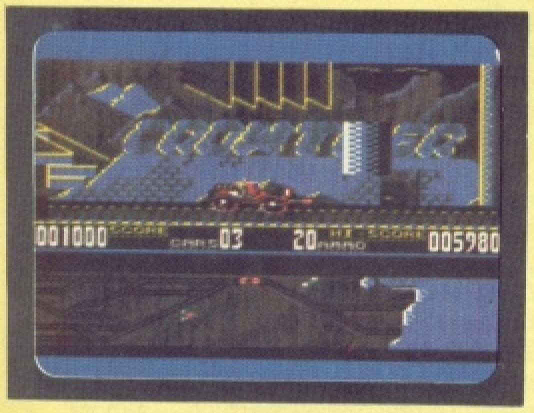


Those of you with undamaged braincells will remember that a couple of months ago, a Tymac offering won the 'game of the month' accolade (admittedly against poor opposition) mostly on the strength of the speech synthesiser. Well, my little chickens, Tymac has done it again, so let's see how it measures up to the last effort.

Gandalf the Sorcerer is based around a *Necromancer* kind of design — and that, after all, is one of the classics. The trick is, of course, to not copy too slavishly. Well, as Gandalf the Wizard, your task is to destroy the lizardmen, who are besieging your castle and you do this by firing bolts at them. Once they're bumped off, the lizards turn into gold coins, which is really jolly decent of them. The dastardly, scaly things are attempting to steal your apprentices, and I bet you're thinking the object is to try to stop that happening. But wait ... if you don't allow them to break down the door, how are you going to collect those nice gold coins? Even a wizard has got to earn a crust you know. The biggest problem is that when the door's broken down, the first of the univited guests is a spider which has a nasty tendency to run into you and transform the wizard into a puddle of shapeless goo. Nasty! Once you run out of spells, it's up to the castle tower where Gandalf is refuelled by a convenient lightning bolt.

Sorry chaps, no award this time!

BLACK THUNDER
Quicksilva/£8.95



Quicksilva has not been without its bad press in this column of late. For every good game that emerges from the portals, out comes a handful of stinkers!

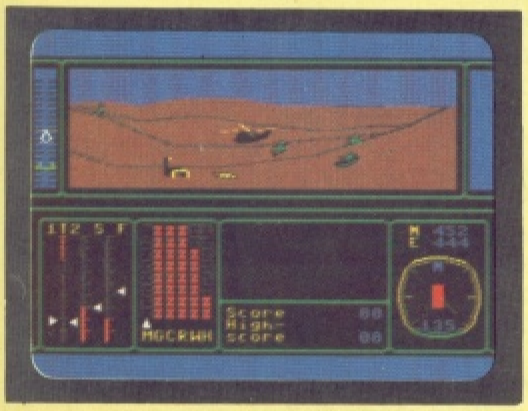
Black Thunder is one of the former and I'm delighted to report, a rare gem indeed. It's an arcade stunner that's fast, frenetic and thoroughly addictive.

As Crow-Ther (the programmer's name in case you didn't know), the object of the exercise is to depart from the town of Wizening on the local motorway system — easy until you realise you're being pursued all the while by the android Highway Patrol.

It's split screen action. On top is your motor, a sort of customised VW Beetle that you see speeding past a rather attractive landscape. Don't however spend too much time admiring it if you want to stay alive for any length of time; keep all eyes firmly on the screen at the bottom. That's where you'll see a scrolling map of the motorway system complete with the helicopters and patrol cars that are coming to git ya! Flying things have a nasty tendency to drop bombs on you, so do everything you can to avoid ending up underneath them. Nifty footwork will get you behind and in position to open fire. To get out of the city alive you have to score a maximum of 10,000 points; this you'll get by offing your pursuers and picking up the little gold things.

Phew! After a game like this I think I'm almost prepared to sit through anything!

COMBAT LYNX
Durell/£9.95



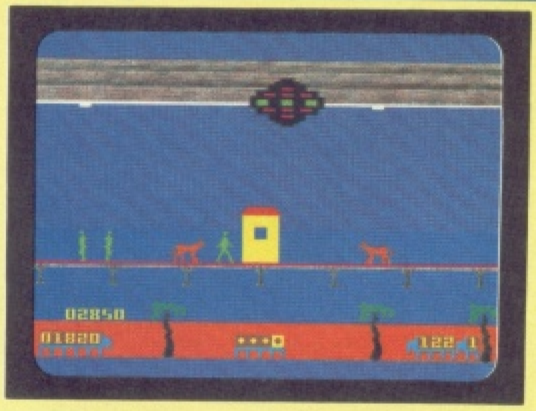
Another candidate for high flyer of the month is *Combat Lynx* from Durell and here, the action involves you guiding a helicopter towards the enemy tanks and hurling missiles at them

A curious game is this. On the face of it *Combat Lynx* seems to have everything going for it: 100 per cent machine code, the assistance of Westland Helicopters, a wealth of controls to play with, a map to wander through — and a choice of weapons! All in all, good stuff which should add up to an absolute stormer ... and yet it doesn't quite make it.

If we're talking about realistic flight stimulators (which I presume we are) then one would surely expect to see the view from the cockpit at all times — and here one doesn't. The only time you're in the saddle is for the few seconds when the enemy tanks are in view and you're having to target on them; most of the time you're looking at the helicopter itself. The terrain has hills and towns — which certainly makes a change from the usual featureless snooker table. Yet the scrolling is unaccountably jerky. Meanwhile, although missiles explode around you, they're hardly worth bothering about because they almost always miss.

Really *Combat Lynx* is not all that bad; I guess I was just expecting something a little better. It seems a shame to waste such good ideas in a 'shoot 'em up' game!

KAMI-KAZE
Supersoft/£5.95

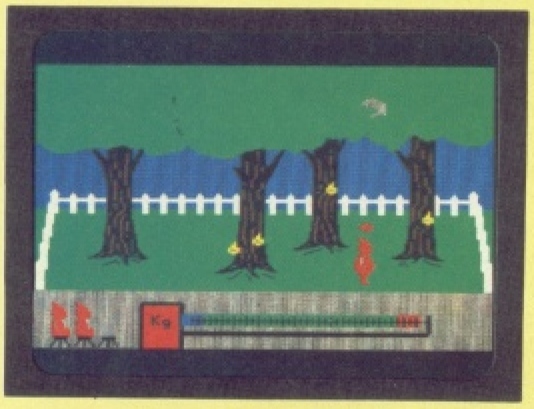


Believe it or not, an alien battle cruiser with the fleet's secret plans has landed on Cleethorpes' pier. But evidently it's a master of inter-planetary disguise for it induces hallucinations in humans and animals, leading them to believe that it's actually a public loo and the secret plans are, in fact, toilet paper! As Commander of the battle fleet hovering over Cleethorpes, your task is to stun the humans and dogs (who have clearly been watching too many Andrex adverts) before the plans go down the pan — sorry, tube.

Obviously, this is a deeply important game with the very future of the galaxy itself at stake. So, clutching the joystick, off we go to save Cleethorpes. The first thing that crosses your mind as you play is that perhaps the local beer weighs a bit heavy ... there do seem to be an awful lot of people wanting to use the loo. The second thing you notice is the joystick only fires horizontally, vertically or at a 45 degree angle — so you have to keep moving the spacecraft to be able to fire in the right direction. Another problem is the clouds ... if they hit you, the spaceship blows up!

The graphics are very nicely designed, way better than the usual bog standard variety. In fact — sorry all Brit programmers — when I first saw the screen I though it *had* to be an American import. Control is nippy and should keep the joystick jocks happy for hours.

PERILS OF BEAR GEORGE
Cheetahsoft/£6.95



If you go down to the woods today, you're sure of a big surprise — a bear by the name of George who wanders around eating apples as they drop out of the trees. So what on earth is he doing? Well, winter is coming on and Bear George has to hibernate ... and you wouldn't want him to starve now would you? (I didn't hear that!)

The game divides into two parts. In the first screen you have to guide George around an orchard, while all about him apples are dropping faster than the value of the pound! Using your trusty joystick, the trick is to position George underneath the falling fruit; pull the stick back, George opens his mouth — and bingo the apple drops inside. If your timing's off, they bounce off his head, but success allows George's fat content to visibly rise. Beware, however, the nutter squirrel!

After a while, just as boredom begins to set in, the scene changes to winter and now it's time to guide George to his cave for his winter snoozie-pooze. Our bear, however, clearly has an incredibly small brain because he's chosen a resting place that's directly underneath a ski-slope and busier than the M1! Your job is to stop silly George being dumped in the snow.

The press release that arrived with this game warns reviewers not to condem it as too easy; things apparently get a lot harder as you go up through the levels. I didn't think it was easy ... I thought it was silly.

DAVID'S MIDNIGHT MAGIC
Ariolasoft/£9.95

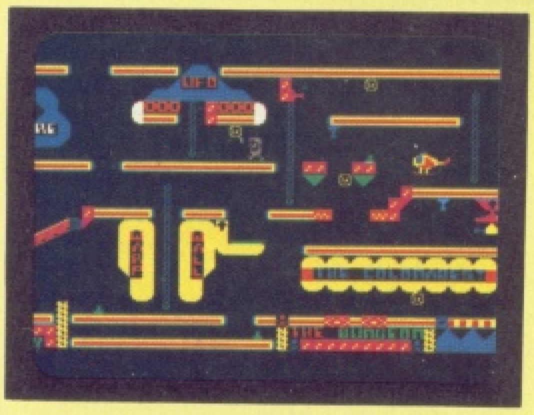


I have a confession to make ... computer games are not my only favourite way of passing the time. OK — so it shows! The thing is, whenever I go into an arcade I always head straight for the pinball tables. Pinball is much more physical ... you can thump the thing and throw it around. Computer games just don't have that aspect and there's no way of releasing that pent-up energy.

So it was with some trepidation that I approached *David's Midnight Magic*, a computerised pinball simulation. I've played pinball simulators before and they've been uniformly awful — hence my suspicions. This one, however, turned out to be the best I've ever come across ... which admittedly isn't saying much! The ball behaves much like a real pinball in that it doesn't exactly follow the paths dictated by Newtonian physics; it has a certain randomness built in. It also travels at more or less the right speed.

What's more, the programmers have even attempted to do something about being able to jolt the machine — in this case you bang away on the space bar. Do it too often and the game 'tilts'. OK it's not ideal, but a nice idea all the same. The flippers are friendly and responsive and with a bit of imagination, I could almost believe I was playing a real pinball machine — almost. But ... why on earth is the game called *David's Midnight Magic*?

BIG BEN
Interceptor Micro/£7.00



Our hero Giz (cheers) has been imprisoned (shame) by the evil wizard Jem (boo), and the only way he can escape is by ringing Big Ben's bell (eh?). But there's a problem (natch) because first Giz has to collect coins that are needed to open the tunnel to the bell.

If you think this sounds like a cue to a ladders and platform game, you'd be right! And you won't be disappointed. Giz starts his endeavours at the bottom left-hand corner of the screen. A few stops away is a turbo plane with which he can make his escape. But don't be fooled into thinking that you can nip in and fly around picking up the gold pieces.

To start with, the plane doesn't fit into some of the tight holes where the coins are hidden and, for another, you can't pick up anything while locked away inside the cockpit anyway. That means Giz has to leg it all around the screen.

You'll find scattered around among the gold coins some interesting looking contraptions which, at first sight, look worthy of investigation. Avoid the temptation — unless you take sadistic delight at turning poor old Giz into pink blancmange!

The Big Ben screen scrolls sideways, which makes a change from the usual umpteen-rooms platform game mode of operation. Overall, it's pretty good — and rather more diverting than usual.

Y64/SPECTRUM UK COMPO

SPOT THE DIFFERENCE

In conjunction with Spectrum UK Ltd, Your 64 *is proud to present its very own Spot The Difference competition. And there's £1,000 worth of Commodore peripherals and software that must be won ...*

This competition involves a skill we happen to know that *Y64* readers are very good at — and, that's spotting mistakes in the magazine (*Hrmph! Ed.*). And, very simply, all we want you to do is take a good look at the two specimen £500 vouchers shown here and see if you can ... spot the difference!

First off, though, here's a clue. The £500 voucher shown in the coupon is the one that's riddled with mistakes. All you have to do is to find them ...

Then, when you think you've spotted all the deliberate mistakes, ring the differences on the £500 voucher inside the coupon and complete the rest of the form. Before you post it off to us, write down the number of differences you found between the £500 vouchers on the back of the envelope.

All Spectrum UK competition entries should be sent to Spectrum UK Competition, *Your 64*, 14 Rathbone Place, London W1P 1DE.

THE WINNER!

Competitions wouldn't be as much fun if there weren't a few prizes flying around ... and that's why there'll be a real £500 voucher for the first correct entry to be picked out of the Editor's hat. And, not only that, Spectrum UK has also stumped up five £100 vouchers for the five runners-up.

Of course, it's no use stomping into any ol' shop demanding goods with one of these vouchers — you'll have to spend it on Commodore peripherals and software only in one of the many Spectrum UK chain stores throughout the UK. And seeing as how Spectrum UK carry virtually every CBM goodie that's around, you're in for a real treat!

SPECTRUM UK RULES OK!

- Entries for the Spectrum UK competition must be post-dated not later than 30th April, 1985.
- Each entry must include a copy of the completed coupon, as well as the number of differences clearly marked on the back of the envelope.
- The Editor's decision is final and no correspondence will be entered into regarding the results of the competition.



Y64/SPECTRUM UK COMPO

SPOT THE DIFFERENCE



I managed to find ... differences between the two £500 vouchers. So, how about a real one then?

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Post this coupon without delay — don't miss out on this great competition! Send your entries off to Spectrum UK Competition, *Your 64*, 14 Rathbone Place, London W1P 1DE. And don't forget to write the number of differences you found in the coupon voucher on the back of your envelope!

MAGAZINE HEALTH WARNING
Think about it before you cut this magazine to pieces — most people prefer to use a photocopy!

KEYBOARD KAPPERS

3D MAZE

Now, another 3D maze program might not sound like the most earth-shattering event since sliced floppy disks but, with a smattering of machine code, this program from our regular Keyboard Kaperist has a lot more to offer than the rest!

Basically, you're stuck in the middle of a labyrinth ... and you suddenly realise that there's a time-lock fitted to the only exit! Before you start off, you'll be able to see a plan view of the maze being drawn on-screen. The exit is always at the top-right of the screen and you — a blue asterisk — start off in the bottom left-hand corner; the maze in-between, as you may have already guessed, is drawn randomly each time, so there's no chance of you memorising the way out!

Once you've seen the maze plan for about ten seconds, you're off! The screen splits into two, with the left-hand side revealing the corridors of the maze; on the right, you'll see a digital clock counting out those precious seconds 'till the exit is sealed forever! Underneath the graphics screen, you'll see a compass that you can use as a guide on your travels — but don't spend too long admiring it ... time is *not* on your side!

There are two pages of on-screen instructions accompanying the game and, once you've read those carefully, you must select the level of difficulty you want. Level one — the beginner's level — allows you five extra looks at the map and five minutes to escape the maze; hardened escapologists might like to select level five — but, be warned, you've only one minute to get through the maze and only one extra look at the maze!

All movement on-screen is accomplished by joystick; the joystick must be placed into Port 2. But, before you rush off and type the program in, there are a few things you ought to watch out for. First up, the triangular symbols in lines 1040-1190 are control codes for the colour cyan. Also, as the program's fit to bursting with machine code, it's a wise move to save the program *before* you run it — a single typing error will more than likely produce a crash and you don't want to have to type it all in again, do you?

The hieroglyphics in the following lines can be entered more easily if you press the CBM key and Shift (to get into lower case mode) and then enter the following text:

```
3050 3D MAZE INSTRUCTIONS PAGE 1
3260 3D MAZE INSTRUCTIONS PAGE 2
4060 3D MAZE LEVEL SELECTION
4150 LEVEL CHOSEN
4170 PUSH UP ON JOYSTICK TO
     CHANGE LEVEL
4180 AND PRESS FIRE BUTTON TO
     SELECT
```

Lastly, the 3D maze strings in lines 9000-10540 are made up of Cursor Home, Cursor Left, Cursor Right, Cursor Down, Reverse On, Reverse Off, Shift £, Shift *, CBM H and CBM N characters (the last two symbols are difficult to identify in the listing when they occur next to solid characters!).

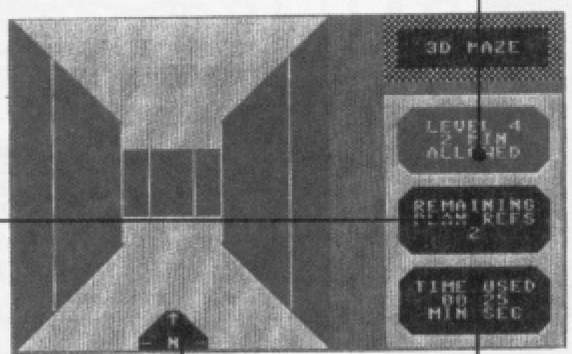
And that's it! So, what are you waiting for? Get lost ... in our amazing 3D maze game!!

MAIN PROGRAM VARIABLES

L(Array)	The location changes representing the four directions used in the random maze generation.
DR$(Array)	Directions North, East, South and West.
LN$(Array) LM$(Array) LF$(Array) CS$(Array) RF$(Array) RM$(Array) RN$(Array)	The string variables that form the seven elements of the 3D maze display. The arrays here are for Left Near, Left Middle, Left Far, Centre, Right Far, Right Middle and Right Near.
MC	Machine code.
JV	Joystick value.
L	The start location for the random maze generator (that is, the middle of the screen).
LV	The level of play (1-5).
P	The position in memory which equates to player's current location in maze. (Players start at location 1905 on-screen which is copied to memory location 50036.)
DR	The direction indicator (1-4).
MO	The change in location resulting from one move by the player.
TA	The number of minutes allowed for each game.
NL	The next location — required by the random maze generator.
LN,LM,LF, C1,C2,C3, RF,RM,RN	The subscript variables for the corresponding string arrays, dependent on the contents of the maze locations.

The number of times you can look at the maze plan depends on the level you chose to start on; here you're on level 4, so you've only got two extra chances to look at the maze.

The amount of time you've got to complete your journey is dependent on the level you choose — take it from us, level 4 is difficult!



The compass at the bottom of the screen is always there to help you guide yourself round the maze. It may seem unimportant, but just wait until you've used up all your extra 'looks' at the maze plan!

This box tells you how much time you've got left to get out of the maze — and with 25 seconds left, don't hang around!

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```
1000 REM#********************************
1010 REM TITLE SCREEN
1020 REM********************************
1030 PRINT"♥"CHR$(142)CHR$(8):POKE53280,
8:POKE53281,8
1040 PRINTTAB(11)"▀▄▌◤▐      ▀▀▀▀▀▀▀◤▐
 ◥"
1050 PRINTTAB(11)"▲        ▐ ▀▀▀▀▀▲ ▐ ◣
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1060 PRINTTAB(15)"▲ ▐ ▀▀▀▀▀▀▲ ▐ ▀▲ ▐ "
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▐    ▀│"
1180 PRINTTAB(8)"◣▐ ▀▐──────────────────
─────────┘"
1190 PRINTTAB(8)"◣▐
 ◤"
1200 PRINTTAB(12)"▀▀▀BY R.BLUNT 1984"
1210 FORJ=1TO6000:NEXT
```

Lines 1000-1210 Print the title screen.

```
2000 REM#********************************
2010 REM SET UP MACH.CODE & CONSTANTS
2020 REM********************************
2030 L(0)=2:L(1)=-80:L(2)=-2:L(3)=80
2040 DR$(1)="N":DR$(2)="E":DR$(3)="S":DR
$(4)="W"
2050 FORJ=828TO878:READMC:POKEJ,MC:NEXT
2060 FORJ=900TO950:READMC:POKEJ,MC:NEXT
2070 GOSUB9000
```

Lines 2000-2070 Assign variable names to the constants, read and POKE the machine code data into the cassette buffer.

```
3000 REM#********************************
3010 REM INSTRUCTIONS
3020 REM********************************
3030 PRINT"♥"CHR$(14);
3040 PRINT"▀▀▀▀▐┌──────────────────────
────────┐"
3050 PRINT"▀▀▀▀│3─ \♠♦─ ╮╱♥│ ─╭┤╮┌╱♥ ┐♠│
─ ┌╱─│"
3060 PRINT"▀▀▀▀└───────────────────────
────────┘"
3070 PRINT"▀ *** ┐─♠♥─ ┐╭┤ ┤┌ │♥│╮─╯ ╮╱
 ┬─┤ 2 ***"
3080 PRINT"▀▀OHILE EXPLORING A LABYRINTH
 OF PASSAGES"
3090 PRINT"YOU LEARN THAT THERE IS A TIM
E LOCK ON"
3100 PRINT"THE ONLY EXIT."
3110 PRINT"▀,SING YOUR COMPASS AND A MAP
 OF THE"
3120 PRINT"PASSAGES, YOU MUST ESCAPE FRO
M THE MAZE"
3130 PRINT"BEFORE IT IS PERMANENTLY SEAL
ED."
3140 PRINT"▀,NFORTUNATELY IF YOU CONSULT
 THE MAP TOO";
3150 PRINT"MANY TIMES IT WILL BE LOST!!
|HIS CAN"
3160 PRINT"MAKE THINGS DIFFICULT."
3170 PRINT"▀◣NITIALLY YOU OBSERVE THE MA
P BEING"
3180 PRINT"DRAWN. OHEN IT IS READY YOUR
POSITION IS";
3190 PRINT"SHOWN BY A BLUE STAR IN THE B
OTTOM LEFT"
3200 PRINT"CORNER. |OU THEN HAVE 10 SECO
NDS TO PLAN";
3210 PRINT"YOUR ROUTE TO THE EXIT, TOP R
IGHT."
3220 PRINT"▀▐ *** ┐─♥♥ ─╮─ │┤│┌╱ ┤┌─
┐♠│─ │○┌ ***";
3230 JV=PEEK(56320):IF(JVAND16)<>0THEN32
30
3240 PRINT"♥";
3250 PRINT"▀▀▀▀▐┌──────────────────────
────────┐"
3260 PRINT"▀▀▀▀│3─ \♠♦─ ╮╱♥│ ─╭┤╮┌╱♥ ┐♠│
─ │○┌│"
3270 PRINT"▀▀▀▀└───────────────────────
────────┘"
3280 PRINT"▀▀ |OUR NEXT VIEW IS FROM WITH
IN THE MAZE."
3290 PRINT"▀ |OUR COMPASS INDICATES THE D
IRECTION YOU";
3300 PRINT"ARE FACING AND EACH MOVEMENT
IS SHOWN BY";
3310 PRINT"A FLASH OF THE POINTER ARROW.
"
3320 PRINT"▀┌N THE RIGHT HAND PANEL, THE
 TIME TAKEN"
3330 PRINT"AND THE TIME ALLOWED ARE DISP
LAYED WITH"
3340 PRINT"THE NUMBER OF MAP REFERENCES
REMAINING"
3350 PRINT"AVAILABLE TO YOU."
3360 PRINTTAB(12)"▀▐┤┌ │♥│╮─╯ ┤┌╱┤ ┘┐└"
3370 PRINTTAB(14)"▀▐\OVE FORWARD"
3380 PRINTTAB(19)"▐↑▐"
3390 PRINTTAB(8)"|URN LEFT ▐─┼─▐ |URN RI
GHT"
3400 PRINTTAB(7)"▀(▐─╮_─▐ BUTTON TO VIEW
 MAP.)"
3410 PRINT"▀▀▐ *** ┐─♥♥ ─╮─ │┤│┌╱ │┌
 ┤┌╱┤╮╱┌─ ***";
3420 JV=PEEK(56320):IF(JVAND16)=0THEN342
0
3430 JV=PEEK(56320):IF(JVAND16)<>0THEN34
30
```

Lines 3000-3430 Display two pages of instructions on-screen, and wait for the fire button to be pressed after each page. (Note that your joystick must be plugged into Port 2.)

```
4000 REM#******************************
4010 REM SET VARIABLES & SELECT LEVEL
4020 REM*******************************
4030 L=1524:LV=1:P=50036:DR=1:MO=-40
4040 PRINT"♥"CHR$(14);:POKE53280,8:POKE5
3281,8
4050 PRINT"■■■■■■■■┌────────────────────
───┐"
4060 PRINT"■■■■■■■■|3─ \♠♦─ L─X─L ♥─L──|┐
Γ/|"
4070 PRINT"■■■■■■■■└────────────────────
───┘"
4080 PRINT"■■─IVE LEVELS OF PLAY ARE AVA
ILABLE THUS:"
4090 PRINT"■■■■■■─X─L 1■ - 5 MINUTES &
5 MAP REFS."
4100 PRINT"■■■■■─X─L 2■ - 4 MINUTES & 4
 MAP REFS."
4110 PRINT"■■■■■─X─L 3■ - 3 MINUTES & 3
 MAP REFS."
4120 PRINT"■■■■■─X─L 4■ - 2 MINUTES & 2
 MAP REFS."
4130 PRINT"■■■■■─X─L 5■ - 1 MINUTES & 1
 MAP REFS."
4140 PRINTTAB(26)"■┌─┐"
4150 PRINTTAB(13)"L─X─L ─|Γ♥─/ |■1■|"
4160 PRINTTAB(26)"└─┘"
4170 PRINT"■■■■┐♠| ┌┐Γ/ ┐|♥|┐─ |Γ ─|
♠/|─ L─X─L"
4180 PRINT"■■■■♠/─ ┐─♥♥ ─┐─ |┘|Γ/ |Γ
♥─L──|";
4190 JV=PEEK(56320):IF(JVAND16)=0THEN419
0
4200 JV=PEEK(56320):IF(JVAND1)=0THENLV=L
V+1:IFLV>5THENLV=1
4210 PRINT"■■■■■■■■■■■■■■■■■■■■■■"TAB(27)RI
GHT$(STR$(LV),1)
4220 IF(JVAND16)<>0THEN4200
4230 PR=6-LV:TA=6-LV:TA$="000"+RIGHT$(ST
R$(TA),1)+"00"
```

Lines 4000-4230 Initialise the variables, display the levels of play available and wait for player to select level using the joystick.

```
5000 REM#******************************
5010 REM RANDOM MAZE GENERATOR
5020 REM*******************************
5030 PRINT"♥■"CHR$(142):POKE53281,15
5040 FORJ=1TO3:PRINT"■■
                    ":NEXT
5050 FORJ=1TO18:PRINT"■■
                    ":NEXT
5060 PRINT"■■■■    ■■■■■■■■┌──────────┐"
5070 PRINT"■■■■■■ ■■■■■■■■■|MAZE PLAN|
"
5080 PRINT"■■■■■■■■■■■■■■■■└──────────┘■"
5090 POKEL+54272,15:POKEL,4
5100 J=INT(RND(1)*4):K=J
5110 NL=L+L(J)
5120 IFPEEK(NL)=160THENPOKENL+54272,15:P
OKENL,J:POKEL+L(J)/2,32:L=NL:GOTO5100
5130 J=J+1:IFJ>3THENJ=0
5140 IFJ<>KTHEN5110
5150 J=PEEK(L):POKEL,32:IFJ<4THENL=L-L(J
):GOTO5100
5160 POKE1143,160:POKE55415,15:POKE1908,
42:POKE56180,6:POKE2,192:SYS828
5170 FORJ=1TO10000:NEXT
```

Lines 5000-5170 Generate a random maze in the form of a plan view, identify the player as a blue asterisk and wait approximately 10 seconds for you to study it.

```
6000 REM#******************************
6010 REM DISPLAY 3D MAZE
6020 REM*******************************
6030 PRINT"♥";:FORJ=1TO24:PRINTTAB(23)"
    ":NEXT
6040 PRINTTAB(23)"■     ■"
6050 PRINTTAB(27)"■■■■■■■■■■■■■":PRINT
TAB(27)"■■         ■■"
6060 PRINTTAB(27)"■■  3D MAZE  ■■":PRIN
TTAB(27)"■■         ■■"
6070 PRINTTAB(27)"■■■■■■■■■■■■■":PRINTT
AB(27)"■■          "
6080 PRINTTAB(28)"■■         ◥"
6090 PRINTTAB(28)"■  LEVEL"LV"■  "
6100 PRINTTAB(28)"■  "TA"■ MIN   "
6110 PRINTTAB(28)"■  ALLOWED  "
6120 PRINTTAB(28)"◥■         ◤"
6130 PRINTTAB(28)"■■◤        ◥"
6140 PRINTTAB(28)"■ REMAINING "
6150 PRINTTAB(28)"■ PLAN REFS "
6160 PRINTTAB(28)"■          "
6170 PRINTTAB(28)"◥■         ◤"
6180 PRINTTAB(28)"■■◤        ◥"
6190 PRINTTAB(28)"■ TIME USED "
6200 PRINTTAB(28)"■          "
6210 PRINTTAB(28)"■  MIN SEC  "
6220 PRINTTAB(28)"◥■         ◤"
6230 PRINTTAB(10)"■■■◤↑◥■■■■◤    ◥■■■■
■■-   -■"
```

Lines 6000-6230 Display the constant parts of the screen associated with the 3D maze.

```
6240 TI$="000000"
```

Line 6240 Sets the internal clock to zero.

```
6250 POKE56187,14:POKE1915,160
```

Line 6250 Blanks out the compass pointer to signal that the player has moved the joystick.

```
6260 ONDR-1GOTO6300,6330,6360
6270 LN=PEEK(P-1):RN=PEEK(P+1):C1=PEEK(P
-40):LM=PEEK(P-41):RM=PEEK(P-39)
6280 C2=PEEK(P-80):LF=PEEK(P-81):RF=PEEK
(P-79):C3=PEEK(P-120)
6290 LD=PEEK(P-121):RD=PEEK(P-119):MV=-4
0:GOTO6390
6300 LN=PEEK(P-40):RN=PEEK(P+40):C1=PEEK
(P+1):LM=PEEK(P-39):RM=PEEK(P+41)
6310 C2=PEEK(P+2):LF=PEEK(P-38):RF=PEEK(
P+42):C3=PEEK(P+3)
6320 LD=PEEK(P-37):RD=PEEK(P+43):MV=1:GO
TO6390
6330 LN=PEEK(P+1):RN=PEEK(P-1):C1=PEEK(P
+40):LM=PEEK(P+41):RM=PEEK(P+39)
6340 C2=PEEK(P+80):LF=PEEK(P+81):RF=PEEK
(P+79):C3=PEEK(P+120)
6350 LD=PEEK(P+121):RD=PEEK(P+119):MV=40
:GOTO6390
6360 LN=PEEK(P+40):RN=PEEK(P-40):C1=PEEK
(P-1):LM=PEEK(P+39):RM=PEEK(P-41)
```

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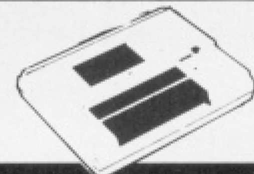
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```
6370 C2=PEEK(P-2):LF=PEEK(P+38):RF=PEEK(
P-42):C3=PEEK(P-3)
6380 LD=PEEK(P+37):RD=PEEK(P-43):MV=-1
```

Lines 6260-6380 Examine the 'maze plan' to identify the contents of the locations in the player's vicinity.

```
6390 IFLN=160THEND1=1
6400 IFLN=32THEND1=2
6410 IFRN=160THEND2=1
6420 IFRN=32THEND2=2
6430 IFC1=160ANDLN=32ANDLM=32THEND1=3
6440 IFC1=160ANDRN=32ANDRM=32THEND2=3
6450 IFC1=160ANDP=49270ANDDR=2THEND3=4:D
4=4:D5=6:D6=6:D7=10:GOTO6630
6460 IFC1=160THEND3=3:D4=3:D5=4:D6=4:D7=
3:GOTO6630
6470 IFLM=160THEND3=1
6480 IFLM=32THEND3=2
6490 IFRM=160THEND4=1
6500 IFRM=32THEND4=2
6510 IFC2=160ANDP=49269ANDDR=2THEND5=5:D
6=5:D7=9:GOTO6630
6520 IFC2=160THEND5=3:D6=3:D7=2:GOTO6630
6530 IFLF=160THEND5=1
6540 IFLF=32THEND5=2
6550 IFRF=160THEND6=1
6560 IFRF=32THEND6=2
6570 IFC3=160ANDP=49268ANDDR=2THEND7=8:G
OTO6630
6580 IFC3=160THEND7=1:GOTO6630
6590 IFLD=32ANDRD=32THEND7=5:GOTO6630
6600 IFLD=32THEND7=6:GOTO6630
6610 IFRD=32THEND7=7:GOTO6630
6620 D7=4
```

Lines 6390-6620 Set the display array subscripts to translate the plan view into a 3D display of seven elements.

```
6630 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■"TAB
(11)"↑■■■■"DR$(DR)"■■"
```

Line 6630 Displays the compass reading.

```
6640 PRINTC$(D7)RF$(D6)LF$(D5)RM$(D4)LM$
(D3)RN$(D2)LN$(D1)
```

Line 6640 Prints the 3D maze display.

```
6650 PRINT"■■■■■■■■■■■■■■■■■■■■■■■"TAB(32)PR
"■■■■■■■■■■"MID$(TI$,3,2)" "MID$(TI$,5,2)
```

Line 6650 Prints the time taken and the number of plan view references.

```
6660 IFTI$>=TA$THEN7000
```

Line 6660 If the player's limited time has expired, the game will end.

```
6670 IFP=49270THEN8000
```

Line 6670 If the player has succeeded in getting through the maze, the game will end!

```
6680 JV=PEEK(56320):J=1
6690 IF(JVAND1)=0ANDPEEK(P+MV)=32THENJ=2
:GOSUB6740
6700 IF(JVAND4)=0THENJ=2:DR=DR-1:IFDR<1T
HENDR=4
6710 IF(JVAND8)=0THENJ=2:DR=DR+1:IFDR>4T
HENDR=1
6720 IF(JVAND16)=0ANDPR>0THENGOSUB6770
6730 ONJGOTO6650,6250
```

Lines 6680-6730 The joystick control sequence.

```
6740 REM MOVE FORWARD
6750 POKEP,32:POKEP+MV,42:POKEP+MV+1024,
6:P=P+MV
6760 RETURN
```

Lines 6740-6760 The subroutine enabling the player to move forward one position.

```
6770 REM FLIP SCREENS
6780 POKE2,200:SYS828:POKE2,192:SYS900:F
ORK=1TO4000:NEXT:POKE2,200:SYS900
6790 PR=PR-1
6800 RETURN
```

Lines 6770-6800 The subroutine to flip the screen from 3D to plan view, and then back to 3D.

```
7000 REM#****************************
7010 REM PLAYER FAILS
7020 REM*****************************
7030 DW$=""
7040 FORJ=1TO24:PRINT"■■"+DW$+"■
                ":DW$=DW$+"■":NEXT
7050 PRINT"■                          ■"
7060 PRINT"■■■■■YOU'VE FAILED"
7070 PRINT"■■■■■ESCAPE FROM THIS MAZE"
7080 PRINT"■■IS NOW IMPOSSIBLE;THE"
7090 PRINT"■■ONLY EXIT HAS BEEN"
7100 PRINT"■■SEALED."
7110 PRINT"■■■■YOUR ONLY CHANCE NOW"
7120 PRINT"■■IS TO TRY AND CONQUER"
7130 PRINT"■■ANOTHER MAZE !!"
7140 PRINT"■■■■PRESSING THE FIRE"
7150 PRINT"■■BUTTON WILL ENABLE"
7160 PRINT"■■YOU TO VIEW YOUR"
7170 PRINT"■■FINAL POSITION AND"
7180 PRINT"■■SELECT THE NEXT MAZE."
7190 POKE50294,2:POKE49270,160
7200 IF(PEEK(56320)AND16)<>0THEN7200
7210 POKE2,192:SYS900:FORJ=1TO8000:NEXT:
GOTO4000
```

Lines 7000-7210 The 'player fails' routine.

```
8000 REM#****************************
8010 REM PLAYER SUCCEEDS
8020 REM*****************************
8030 DW$=""
8040 FORJ=1TO24:PRINT"■■"+DW$+"■
                ":DW$=DW$+"■":NEXT
8050 PRINT"■                          ■"
8060 PRINT"■■■■YOU'VE SUCCEEDED"
8070 PRINT"■■■■■PERHAPS YOU OUGHT TO"
8080 PRINT"■■TRY ANOTHER MAZE (AT"
8090 PRINT"■■A HIGHER LEVEL ?)."
8100 PRINT"■■■■PRESSING THE FIRE"
8110 PRINT"■■BUTTON WILL RETURN"
8120 PRINT"■■YOU TO THE LEVEL"
8130 PRINT"■■SELECTION SCREEN."
8140 IF(PEEK(56320)AND16)<>0THEN8140
8150 GOTO4000
```

Lines 8000-8150 The 'player succeeds' routine.


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```
9000 REM#*******************************
9010 REM 3D MAZE DISPLAY STRINGS
9020 REM********************************
9030 REM LEFT NEAR CLOSED
9040 T$(1)="      |"
9050 T$(2)="      |      |"
9060 T$(3)="      |"
9070 LN$(1)=T$(1)+T$(2)+T$(3)
9080 REM LEFT NEAR OPEN (LEFT MIDDLE CLO
SED)
9090 T$(1)=""
9100 T$(2)="      |"
9110 T$(3)=""
9120 LN$(2)=T$(1)+T$(2)+T$(3)
9130 REM LEFT NEAR OPEN (LEFT MIDDLE OPE
N)
9140 T$(1)=""
9150 T$(2)="      "
9160 T$(3)=""
9170 LN$(3)=T$(1)+T$(2)+T$(3)
9180 REM LEFT MIDDLE CLOSED
9190 T$(1)=""
9200 T$(2)="      |"
9210 T$(3)=""
9220 T$(4)=""
9230 LM$(1)=T$(1)+T$(2)+T$(3)+T$(4)
9240 REM LEFT MIDDLE OPEN
9250 T$(1)=""
9260 T$(2)="      |      |"
9270 T$(3)="      "
9280 T$(4)=""
9290 LM$(2)=T$(1)+T$(2)+T$(3)+T$(4)
9300 REM LEFT MIDDLE BLOCKED
9310 T$(1)=""
9320 T$(2)="      "
9330 T$(3)="      "
9340 T$(4)=""
9350 LM$(3)=T$(1)+T$(2)+T$(3)+T$(4)
9360 LM$(4)=""+LM$(3)+""
9370 REM LEFT FAR CLOSED
9380 T$(1)=""
9390 T$(2)=""
9400 LF$(1)=T$(1)+T$(2)
9410 REM LEFT FAR OPEN
9420 T$(1)=""
9430 T$(2)=""
9440 T$(3)=""
9450 LF$(2)=T$(1)+T$(2)+T$(3)
9460 REM LEFT FAR BLOCKED (SMALL)
9470 T$(1)=""
9480 T$(2)=""
9490 T$(3)=""
9500 LF$(3)=T$(1)+T$(2)+T$(3)
9510 LF$(5)=""+LF$(3)+""
9520 REM LEFT FAR BLOCKED (LARGE)
9530 T$(1)=""
9540 T$(2)=""
9550 T$(3)=""
9560 LF$(4)=T$(1)+T$(2)+T$(3)
9570 LF$(6)=""+LF$(4)+""
9580 REM RIGHT NEAR CLOSED
9590 T$(1)=""
9600 T$(2)="|      |      "
9610 T$(3)=""
9620 T$(4)=""
9630 RN$(1)=T$(1)+T$(2)+T$(3)+T$(4)
9640 REM RIGHT NEAR OPEN (LEFT MIDDLE CL
OSED)
9650 T$(1)=""
9660 T$(2)=""
9670 T$(3)="|      |      "
9680 T$(4)=""
9690 RN$(2)=T$(1)+T$(2)+T$(3)+T$(4)
9700 REM RIGHT NEAR OPEN (LEFT MIDDLE OP
EN)
9710 T$(1)=""
9720 T$(2)=""
9730 T$(3)="      "
9740 T$(4)=""
9750 RN$(3)=T$(1)+T$(2)+T$(3)+T$(4)
9760 REM RIGHT MIDDLE CLOSED
9770 T$(1)="      "
9780 T$(2)="      |      "
9790 T$(3)="      |"
9800 T$(4)=""
9810 RM$(1)=T$(1)+T$(2)+T$(3)+T$(4)
9820 REM RIGHT MIDDLE OPEN
9830 T$(1)=""
9840 T$(2)="
```

•KEYBOARD KAPERS•

```
█████     ██████     ██████     ██████"
9850 T$(3)="|     ██████     ██████     █
█████     ██████     ██████     "
9860 T$(4)="██████     ██████     ██████
██"
9870 RM$(2)=T$(1)+T$(2)+T$(3)+T$(4)
9880 REM RIGHT MIDDLE BLOCKED
9890 T$(1)="████████████████████     ███
███     ██████     ██████     ██████"
9900 T$(2)="     ██████     ██████     █
█████     ██████     ██████     "
9910 T$(3)="██████     ██████     ██████
██████     ██████     "
9920 T$(4)="██████     ██████     ██████
██████     ██"
9930 RM$(3)=T$(1)+T$(2)+T$(3)+T$(4)
9940 RM$(4)="█"+RM$(3)+"█"
9950 REM RIGHT FAR CLOSED
9960 T$(1)="████████████████████  ███  ███
 ███  ███  █████  ███  ███  ███  "
9970 T$(2)="███  ███  █████  ███  ████
███  ███  ███  ███  █"
9980 RF$(1)=T$(1)+T$(2)
9990 REM RIGHT FAR OPEN
10000 T$(1)="████████████████████  ███  ███
  ███  ███  ███  ███  ███"
10010 T$(2)="█  ███  ███  ███  ███  ███
███  ███  ███  ███"
10020 T$(3)="  ███  ███  █"
10030 RF$(2)=T$(1)+T$(2)+T$(3)
10040 REM RIGHT FAR BLOCKED (SMALL)
10050 T$(1)="████████████████████  ███  ███
  ███  ███  ████  ███  ███"
10060 T$(2)="  ███  ███  ███  ███  ███
███  ████  ███  ███"
10070 T$(3)="  ███  ███  █"
10080 RF$(3)=T$(1)+T$(2)+T$(3)
10090 RF$(5)="█"+RF$(3)+"█"
10100 REM RIGHT FAR BLOCKED (LARGE)
10110 T$(1)="████████████████████  ███  ███
█  ███  ███  ███  ███"
10120 T$(2)="  ███  ███  ███  ███  ███
███  ███  ███  ███"
10130 T$(3)="  ███  ███  ███"
10140 RF$(4)=T$(1)+T$(2)+T$(3)
10150 RF$(6)="█"+RF$(4)+"█"
10160 REM CENTRE BLOCKED SMALL
10170 T$(1)="███████████████████  ████  ███
█  ████  ████  ████  ████  ████"
10180 T$(2)="█  ████  ████  ████  ████  ███
███  █████  ████  ████  ████  ████"
10190 T$(3)="  ████  ████  █"
10200 C$(1)=T$(1)+T$(2)+T$(3)
10210 C$(8)="█"+C$(1)+"█"
10220 REM CENTRE BLOCKED MEDIUM
10230 T$(1)="███████████████████  ████  ███
█  ████  ████  █████  ████  ████"
10240 T$(2)="  ████  ████  ████  ████
█  ████  ████  █████  ████"
10250 T$(3)="  ████  ████  █"
10260 C$(2)=T$(1)+T$(2)+T$(3)
10270 C$(9)="█"+C$(2)+"█"
10280 REM CENTRE BLOCKED LARGE
10290 T$(1)="███████████████████  ████  ███
███  ████  ████  ████  ████  ████"
10300 T$(2)="  ████  ████  ████  ███
█  ████  ████  ████  ████  ████"
10310 T$(3)="  ████  ████  ███"
10320 C$(3)=T$(1)+T$(2)+T$(3)
10330 C$(10)="█"+C$(3)+"█"
10340 REM CENTRE FAR OPEN
10350 T$(1)="███████████████████  ████  ███
█  ████  ████  ████  █████"
10360 T$(2)="█ █████||████||████||███
████  ████  ████  ████  ████  "
10370 T$(3)="████  ████  ████  █"
10380 C$(4)=T$(1)+T$(2)+T$(3)
10390 REM LEFT AND RIGHT DISTANT OPEN
10400 T$(1)="███████████████████  ████  ███
█  ████  ████  ████  ████  ████"
10410 T$(2)="  █████||████||████||███
███  ████  ████  ████  ████  "
10420 T$(3)="████  ████  ████  █"
10430 C$(5)=T$(1)+T$(2)+T$(3)
10440 REM LEFT DISTANT ONLY OPEN
10450 T$(1)="███████████████████  ████  ███
█  ████  ████  ████  ████  ████"
10460 T$(2)="  █████||████||████||███
███  ████  ████  ████  ████  "
10470 T$(3)="████  ████  ████  █"
10480 C$(6)=T$(1)+T$(2)+T$(3)
10490 REM RIGHT DISTANT ONLY OPEN
10500 T$(1)="███████████████████  ████  ███
█  ████  ████  ████  ████  ████"
10510 T$(2)="██  █████||████||████||
█████  ████  ████  ████  ████  "
10520 T$(3)="████  ████  ████  █"
10530 C$(7)=T$(1)+T$(2)+T$(3)
10540 RETURN
```

Lines 9000-10540 Display strings for the 3D maze.

```
11000 REM#********************************
11010 REM MACHINE CODE DATA
11020 REM*********************************
11030 REM SAVE SCREEN & COLOUR RAM TO ME
MORY
11040 DATA169,0,133,251,133,253,169,4,13
3,252,165,2,133,254,162,4,177,251,145
11050 DATA253,200,208,249,230,252,230,25
4,202,208,242,169,216,133,252,162,4
11060 DATA177,251,145,253,200,208,249,23
0,252,230,254,202,208,242,96
11070 REM RETRIEVE SCREEN & COLOUR RAM F
ROM MEMORY
11080 DATA169,0,133,251,133,253,169,4,13
3,252,165,2,133,254,162,4,177,253,145
11090 DATA251,200,208,249,230,252,230,25
4,202,208,242,169,216,133,252,162,4
11100 DATA177,253,145,251,200,208,249,23
0,252,230,254,202,208,242,96
```

Lines 11000-11100 Produce the data for the machine code which flips the screen.

TYPING TRAUMAS For those who subscribe to our **Y64 Checksum** program, included in **Y64** issue 7, you can write to us for a photocopy of the checksum table you'll need for **3D Maze**. As you can imagine, the checksum table for this program is almost as long as **3D Maze** itself! If you'd like a photocopy of the checksum table for **3D Maze**, send a stamped-addressed envelope to 3D maze Checksum, **Your 64**, 14 Rathbone Place, London W1P 1DE. So, if typing in listings often damages your sanity, subscribe to the **Y64 Checksum** program and dispel your typing traumas!

PROGRAMMER OF THE YEAR

Are you a brilliant programmer just waiting to be discovered? Have you been hiding your bytes under a bushel? Well, now's your chance to receive the acclaim you deserve.

Your 64 magazine has teamed up with Commodore UK and we're starting the search for a very special person — the *Your 64* Programmer of the Year. And that could be you ...

So, if you've written a program for the Commodore 64 (or if this is the push you've always needed to make you sit down and write one!) then we want to hear from you. It doesn't matter whether it's an arcade game, an adventure or a utility, just so long as it's all your own work.

Fame and Fortune?

There'll be no limits to the subject matter or the number of programs that you submit. All the programs will be assessed on the programming skills displayed and their ability to carry out the function for which they were written. So, if it's a game we'd be looking to have some fun ... a utility would be expected to work!

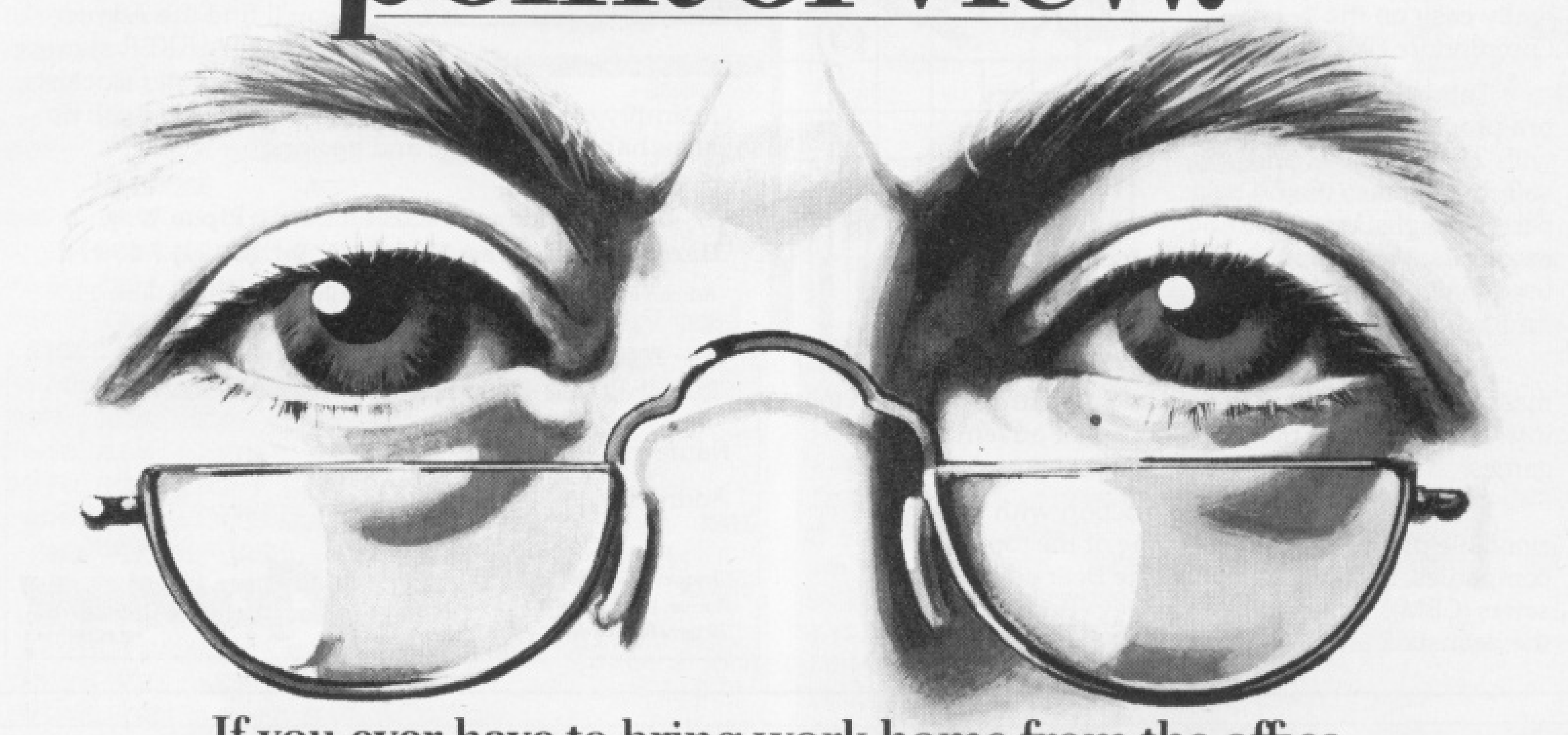
The only limit we're going to impose on you is the amount of code you've got to play around with. Your finished programs should be no larger than 5K — so, use those bytes sparingly. Of course, those of you who want to mess about with machine code have an advantage here — but this isn't a test of who thinks best in binary. The programs will be judged for structure, use of sound, user-friendliness, professional polish and, above all, ideas.

We'll publish the best six programs submitted to the competition in our illustrious magazine, one per issue starting in July 1985. The last possible date on which we can accept programs is October 31st, 1985. But if you've already written your entry, then send it off to us now or you'll miss out on the early judging. So, you've got plenty of time to start working on that masterpiece. The six programs published will then go into the final judging to choose the 1985 *Your 64* Programmer of the Year.

There'll be a panel of three judges to pick the six finalists. Step forward Chris Palmer (star of the home computer keyboard), a well-known personality from the wacky world of commercial software (*OK, so we don't know who it'll be yet! Ed.*) and our overworked Editor.

If you want to be up there amongst the lucky six, start programming now. Fame and fortune could come your way ... and for more details of that, watch this space next month for the prizes you'll be going for. In the meantime, get programming!

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PRACTIFILE 64.

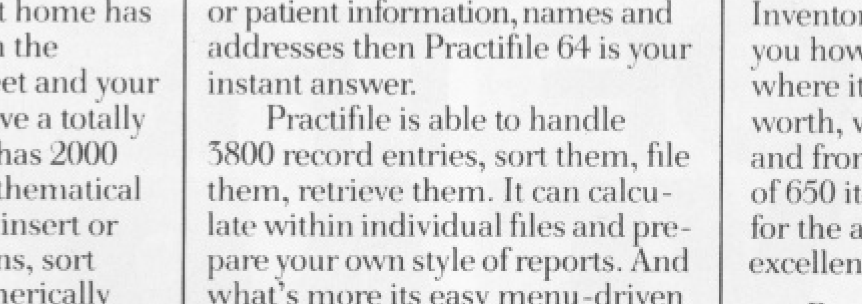
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ROUTINE STUFF!

In this, the penultimate part of our machine code series, Andrew Bennett *takes a close look at the 64's built-in subroutines.*

Let's start this month's introduction to machine code by showing you the machine code equivalent of the Basic command GOSUB. As you all know, GOSUB is short for GOto SUBroutine and is used to jump to a routine that you wish to use several times during your program. To save you typing in the routine every time you want to use it, you simply GOSUB to the routine. (Using subroutines also helps to save memory which, even in machine code, can be important.) When Basic meets a RETURN command it continues executing your program from the statement after the GOSUB that called it. It knows where to jump back to because, when the GOSUB is executed, Basic remembers the GOSUB's line number.

We can do a similar thing in machine code using the JSR (Jump to SubRoutine) command. JSR takes the form:

JSR $QQQQ (where QQQQ can be any four digit Hex number or, of course, a label)

When the 64 meets a JSR command it remembers whereabouts in memory the JSR is, and then transfers to the subroutine. At the end of the subroutine the 64 will find an RTS (ReTurn from Subroutine) Subroutine) and transfer back to the point just after the JSR command. Have a look at the MACHINE CODE SUBROUTINES box if you don't understand this completely. This example also uses a Kernal routine explained later in this article.

Subroutines in machine code are just as useful as they are in Basic, and you should use them as much as possible. You could, for example, have a subroutine to clear the Hi-res screen which you could call from several different parts of your program.

Another command that we should look at here is the JMP (JuMP) command. JMP is the exact equivalent of Basic's GOTO command. It takes a similar form to JSR:

JMP $QQQQ

JMP, like GOTO, often indicates sloppy programming and should really be 'planned around' if possible, by trying to keep the logical flow of your program as a straight line rather than jumping around all over the place.

Last month I told you that I'd show you how to multiply and divide numbers by 2. Let's look at multiplication first.

The multiplication command in machine code works on numbers in a binary format and is called ASL (Arithmetic Shift Left). Arithmetic Shift Left is quite a mouth full, but it simply means that each bit in the number is moved one bit left. So that bit 0 becomes bit 1, bit 1 becomes bit 2, etc. If you think about it, since binary is base two, this effectively means that the number is multiplied by 2 — as long as the result is smaller than 255 ($FF). During the ASL operation the 7th bit is moved into the Carry flag. You can therefore check the Carry flag to find out if an overflow (Carry) has occurred. Using ASL more than once means that the number will be multiplied by the appropriate power of 2. For example, using ASL three times will multiply the number by 8, four times by 16 and five times by 32.

The different forms of the ASL commands can be found on page 236 of the Programmers' Reference Guide. We've already looked at all of these addressing modes except ASL A.

ASL A is used to multiply the accumulator by two. This form is not really a proper addressing mode and can only be used with certain commands (it would be difficult to have LDA A!).

The command to divide numbers by two is quite similar to ASL and is called Logical Shift Right or LSR for short. LSR is the exact reverse of the ASL command, because each bit is moved one to the right and the number is divided by 2. In the case of LSR, bit zero moves into the Carry flag and can be tested for an underflow (where the result rolls-under from $00 to $FF). Successive uses of LSR will cause the number to be divided by 4, 8, 16 and so on. The different forms of LSR are given on page 246 of the Programmers' Reference Guide (PRG).

The ASL and LSR commands are examples of machine code commands that have no direct Basic equivalents. Using these, and the addition/subtraction commands given last month, you should be able to multiply or divide any number (in the range $00-$FF) by any other. For example, to multiply a number (N) by 3, multiply N by 2 and add the original number (2N+N = 3N).

Last month I showed you how to add and subtract numbers as long as they stayed within the $00-$FF range. In the case of an addition, I told you that the Carry flag shows whether an addition has 'rolled-over', as long as it is cleared before the ADC command. We can use the Carry flag to allow us to add numbers together in the range 0-65535 ($0000-$FFFF) like this:

```
LDA $22      !Make Accumulator equal to the value of
             !location $22
CLC
ADC #$08     !Add #$08 to the accumulator
STA $22      !Put the result back in $22
BCC REST     !Branch if the addition has not overflowed and
             !the Carry is still clear (0).
             !STA does not effect the value of the Carry
```

THE COMPLETE Y64
MACHINE CODE TUTOR

This month:

- Multiplication and division by 2.
- Addition and subtraction of numbers over $FF.
- The last addressing mode.
- Kernal routines.
- Subroutines.

HOMEWORK SOLUTION

```
110 !
120 !
130 !
140 !
150 * = $C000 !START ADDRESS
160 !
170                LDA $033F    !SUBTRACT OR ADD (831)
180                CMP #$00     !ZERO IS ADD
190                BEQ ADD
192                CMP #$01     !ONE IS SUBTRACT
194                BEQ SUBTRACT
196                RTS          !RETURN IF NOT SET UP PROPERLY
198 !
200 SUBTRACT       LDA $033E    !SUBTRACT 10 FROM 830
210                SEC
220                SBC #$0A     !10
230                STA $033E
240                RTS
250 !
260 ADD            LDA $033E    !ADD 10 TO 830
270                CLC
280                ADC #$0A     !10
290                STA $033E
300                RTS
310 !
```

This here's a program that solves the problem set in *Y64*, issue 6.

```
LDA $23     !This part of the program adds one to the Hi
            !part of the number
ADC #$01    !Thereby taking care of the overflow.
STA $23
REST        ..Rest of Program.
```

The above example does not by any means show the best method of dealing with overflows during addition of 16-bit (4 Hex digit) numbers. In fact it involves a branch instruction that is unnecessary. A much better method is:

```
LDA $22
CLC
ADC #$08
STA $22     !As before so far
LDA $23     !Notice that the Carry hasn't been cleared this
            !time
ADC #$00    !Add zero to the Hi part of the number
STA $23     !And place the result back into the Hi.
```

Only the part of the program that deals with an overflow is changed. How have we dealt with the problem of the overflow by adding zero to the hi part of the number? If you remember, last month I told you that ADC adds the values of accumulator, the argument after the ADC command *and* the Carry flag. This is why, for most additions, the Carry flag must be cleared before the ADC command. If an overflow occurred during the addition of the lo part of the 16-bit number, then the Carry flag will be set. The Carry will then be added to the hi part of the number during the ADC #$00 command, thus taking care of the overflow. If there was no overflow the Carry will not be set and zero will be added to the hi part of the number. The first method is easier to follow, but the second is far more elegant.

Kernal

We've already covered jumping subroutines in this part of the machine code tutor. Inside the 64's operating system, or Kernal (the programs that keep the 64 running), are several useful subroutines. These common subroutines are used by the operating system so that it can fit into as small an amount of memory as possible. As machine code programmers, we can also call these subroutines in our programs. There are subroutines to print characters to a file, save or load to disk or tape, take input from the keyboard and many others which are not used as often as the above, but can be very useful.

Each subroutine has its own name and address. These can be found on pages 270-306 of the Programmers Reference Guide (PRG). Before you can use a subroutine, you must set the Accumulator and the indexes to certain values which are passed to the subroutine. These values are outlined in the pages of the PRG mentioned above. In this part of the machine code tutor, I'll be looking at a few of the Kernal subroutines that I find most useful.

The first of these is called CHROUT (*PRG, page 278*) which is short for CHaRacter OUT. This subroutine prints a character to an open file. If, however, you don't open a file before you use CHROUT the character is printed onto the next available position on the screen. CHROUT's address is $FFD2. To use CHROUT, you simply set the accumulator to the ASCII value of the required character then JSR to $FFD2. For example:

```
LDA #$41
JSR $FFD2
```

Would print 'A' (ASCII 65) on the screen. Since ASCII codes are different to screen codes on the 64, you will find that this, in fact, produces a shifted-A on the screen.

To move the next printing position about the screen, you can use another Kernal routine: PLOT (*$FFF0, PRG, p290*) to place the cursor where you wish to print the character. To use the PLOT routine you must set the X index to the row number and the Y index to the column number at which you want to print.

As well as using CHROUT for printing the normal character set to the screen (or a file), you can also use it to print the other ASCII codes. This means that, for the first time in machine code, you have a very simple method of clearing the screen. The ASCII code for clearscreen is 147. Therefore, to clear the screen, use:

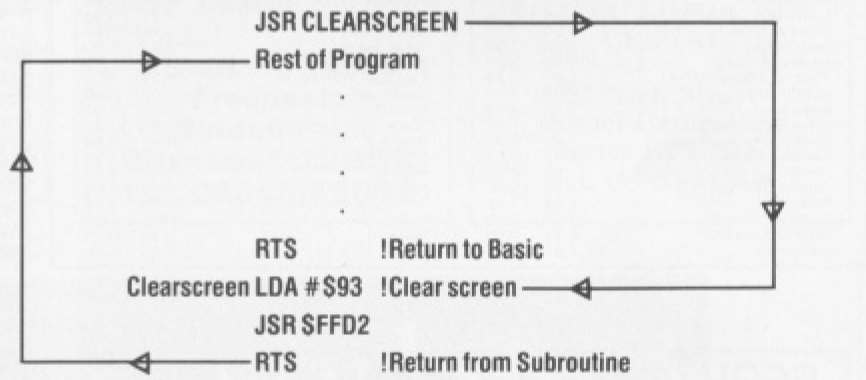
```
LDA #$93
JSR $FFD2
```

You must remember that clearing the screen also resets the colour screen so that if you don't re-shade it after executing the above, any further STAs to the screen won't show up because they'll be in the same colour as the screen.

Another very useful Kernal subroutine saves an area of memory to disk or tape and is called, not surprisingly, SAVE (*$FFD8, PRG p293*). The use of this routine is slightly more complicated than the use of CHROUT or PLOT. To use SAVE you must first JSR to two other Kernal subroutines — SETLFS and SETNAM.

SETLFS (*$FFBA, PRG p297*) opens up a file to the cassette or disk (or printer when it is used with

MACHINE CODE SUBROUTINES



Just as you use GOSUB and RETURN to jump to a Basic subroutine, JSR (Jump to SubRoutine) and RTS (ReTurn from Subroutine) are used in machine code. The above example clears the screen.

CHROUT) on which you can save an area of memory. Make the X index equal to the device number before calling SETLFS.

SETNAM (*$FFBD, PRG p299*) sets the name to be saved on the tape or disk. If you are saving to tape, you have the option of leaving the name blank. This is done by setting the accumulator to zero, otherwise the accumulator is set to the length of the name. The X and Y indexes are used to point to where you have the name in memory. The X index should hold the lo part of the address and the Y index the hi part before you call SETNAM.

Now, finally, you can use the SAVE routine. First store the hi and lo parts of the start address of the block of memory that you wish to save, in $23 and $22 respectively. Make the accumulator equal to the number $22, which is the offset from location zero of the pointer at $22. Now make the X index equal to the lo part of the end address and the Y index equal to the hi part of the end of the block of the area of memory to be saved. Now JSR to the SAVE subroutine at $FFD8. If you don't fully understand the above, have a look at the SAVING MEMORY TO TAPE program which gives an example of the SAVE subroutine in use.

There's also a Kernal subroutine to load an area of memory in from tape or disk. This is called LOAD (*$FFD5, PR p286*) and once again SETLFS and

YOUR 64 *MISELLANEAD*

YOUR 64 *MISELLANEAD*

SETNAM must be used before it. Have a look at the LOADING MEMORY FROM TAPE program for an example of the Kernal LOAD subroutine in use.

Last time I promised to give you the addresses of the Kernal routines that allow you to convert the contents of the Floating Point Accumulator (FAC) into an integer. Using this routine allows you to pass numbers to your machine code programs via the USR commands. To use the USR command simply follow these steps:

(1) POKE the lo and hi parts of the address of your machine code program into locations 785 and 786 respectively.

(2) Use the command such as:

D = USR (Z)

Where Z can have any value from 0 – 65535. Control will now be transferred to your machine code program at the address pointed at by locations 785 and 786. To convert Z so that your machine code program can use it, JSR to the conversion routine at $BC9B. After you call this routine the lo part of Z will be in location $65 and the hi part will be in $64, ready for use by your machine code program.

(3) Before you RTS back to Basic, place the lo part of the result in the Y index and the hi part in the accumulator and JSR to a routine at $B391. This subroutine places the result back into the FAC.

(4) RTS to Basic and now D will hold the result from your machine code program.

USR can be a very useful method of passing numbers between Basic and machine code, but it is often easier simply to POKE the number into a location and have your machine code program get the number from that location.

We'll finish this month by looking at the last of the addressing modes that the 64's processor (the 6510) offers. This addressing mode is called Indexed Indirect. I must admit I've never used this mode in my own machine code programs, because its use is quite limited. You should, however, keep it in mind, just in case you find a case where it might be very useful. It has the form:

LDA ($22,X)

In the above case the accumulator is loaded with the value of the location which is pointed at by a lo-hi pointer starting at $22+X. Confused? Here's an example which should help to make things clear:

```
LDA #$00
STA $22
LDA #$01
STA $24
LDA #$04
STA $23
STA $25
```

In the above the lo-hi pointers $22/$23 and $24/$25 are initialised to point at $0400 and $0401, the top-left and one to the right of top-left of the screen.

```
LDX #$00
LDA #$02   !B
STA ($22,X)
```

If X is zero then 'B' is placed in the top-left of the screen and if X were 2 then 'B' would appear one character to the right of top-left.

Using this mode lets you set up a table of pointers in zero page, but there isn't really enough room in zero page for a large table, so as I've already said, this mode isn't all that useful.

Conclusion

With only one part of the Machine Code Tutor remaining, you should be feeling confident with machine code and be ready to experiment. Next month we'll wrap everything up and I'll show you how to plan a long machine code program.

In the meantime, if you've got any questions about the course, send them in to me and I'll answer them in a follow-up article (please enclose an sae if you'd like a personal reply also).

Homework

This month's homework is to test that you've understood this month's section about the 64's Kernal routines. During the next month, I want you to write a program that puts your name on the screen in 6 different places. Clue: you should use a subroutine to print your name using CHROUT and a loop that moves the cursor about the screen using PLOT. Not too difficult really — answer next month.

Next month:

- More bit manipulation commands.
- How to plan your machine code programs.
- What have we learnt?
- The Y64 Machine Code Tutor ends next month.

SAVING MEMORY TO TAPE

```
10  !PROGRAM 2.1 - SAVE TO TAPE
20  !
30  !
100 * = $C000
105 !
110 SETLFS      =    $FFBA  !SET UP LABELS
120 SETNAM      =    $FFBD
130 SAVE        =    $FFD8
140 !
148             LDY #$FF    !NO SECONDARY ADDRESS
149             LDA #$01    !LOGICAL FILE NUMBER = 1
150             LDX #$01    !TAPE = DEVICE NUMBER 1
160             JSR SETLFS
165 !
170             LDA #00     !NO FILE NAME - TAPE SAVE
180             JSR SETNAM
185 !
190             LDA #$00    !LO PART OF START ADDRESS
200             STA $22
210             LDA #$70    !HI PART OF START ADDRESS (=$7000)
215             STA $23
220             LDX #$00    !LO PART OF END ADDRESS
230             LDY #$71    !HI PART OF END ADDRESS ($7100)
240             LDA #$22    !OFFSET FOR START ADDRESS
250             JSR SAVE
260 !
270             RTS
280 !
310 !
320 !THE ABOVE PROGRAM SAVES AN AREA OF MEMORY
    ($7000-$7100) TO TAPE WITH
330 !NO FILE NAME.
340 !
```

LOADING MEMORY FROM TAPE

```
100 !PROGRAM2.2 - LOAD
110 !
120 !
130 !
140 !
150 * = $C000
160 !
170 !DEFINE LABELS
180 !
190 SETLFS      =   $FFBA
200 SETNAM      =   $FFBD
210 LOAD        =   $FFD5
220 !
230             LDA #$01            !FILE NUMBER = 1
240             LDX #$01            !TAPE DEVICE = 1
250             LDY #$01            !NOT A RELOCATED LOAD
260             JSR SETLFS
270 !
280             LDA #$00            !NO FILE NAME
290             JSR SETNAM
300 !
310             LDA #$00            !LOAD NOT VERIFY
320             JSR LOAD
330 !
340             RTS
350 !
360 !
370 !THE ABOVE PROGRAM LOADS THE NEXT
380 !PROGRAM FROM TAPE.
390 !
```

The two programs above show how you can make use of the Kernal subroutines in your own programs; the top listing shows the Kernal SAVE subroutine in action, the one at the bottom includes the Kernal LOAD subroutine.

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- Commodore 64 software to exchange, 600 programs. Please send list to Rene Van Hal, Stuwstraat 12, 2332 XM, Leiden, Holland.

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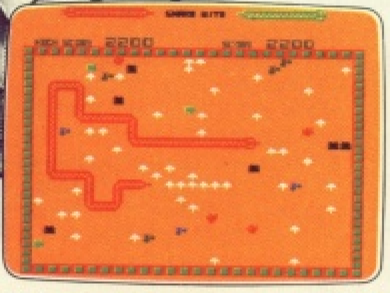
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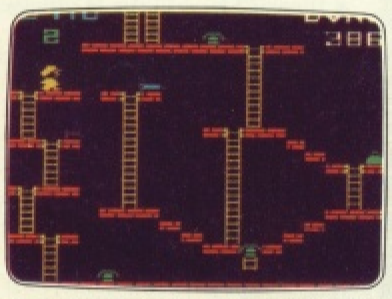
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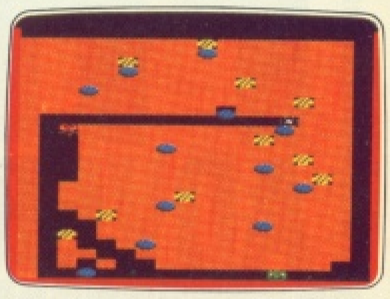
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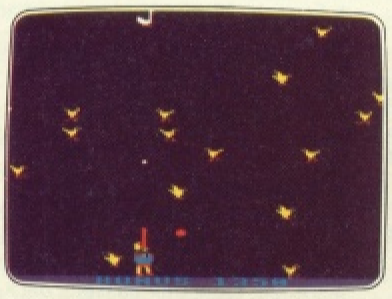
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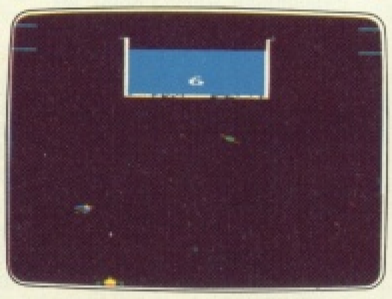
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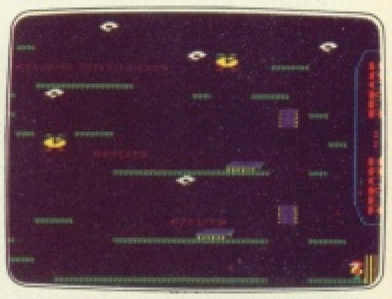
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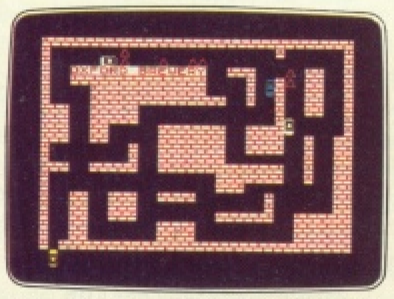
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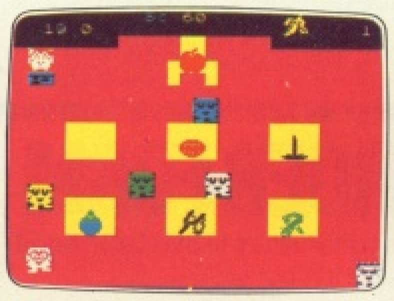
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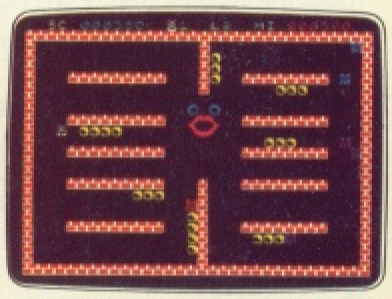
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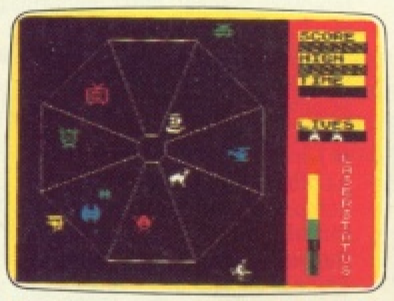
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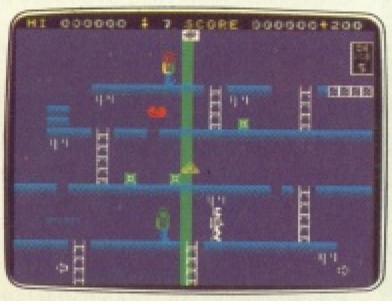
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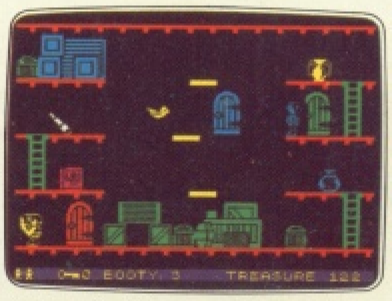
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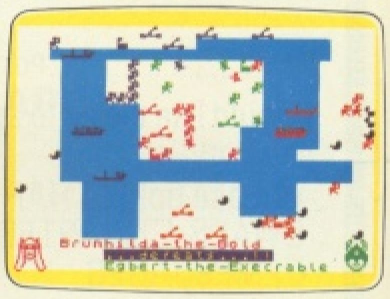
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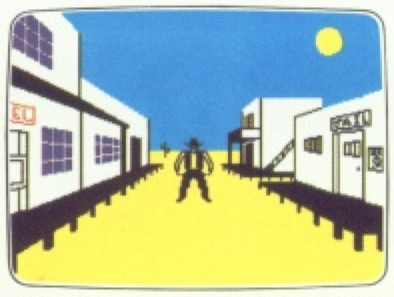
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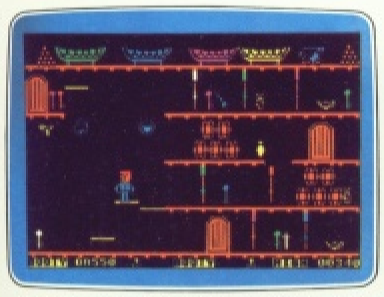
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